FARM CHEMICALS

August Volume 122 No. 8 50 Cents
Pioneer Journal of the Industry

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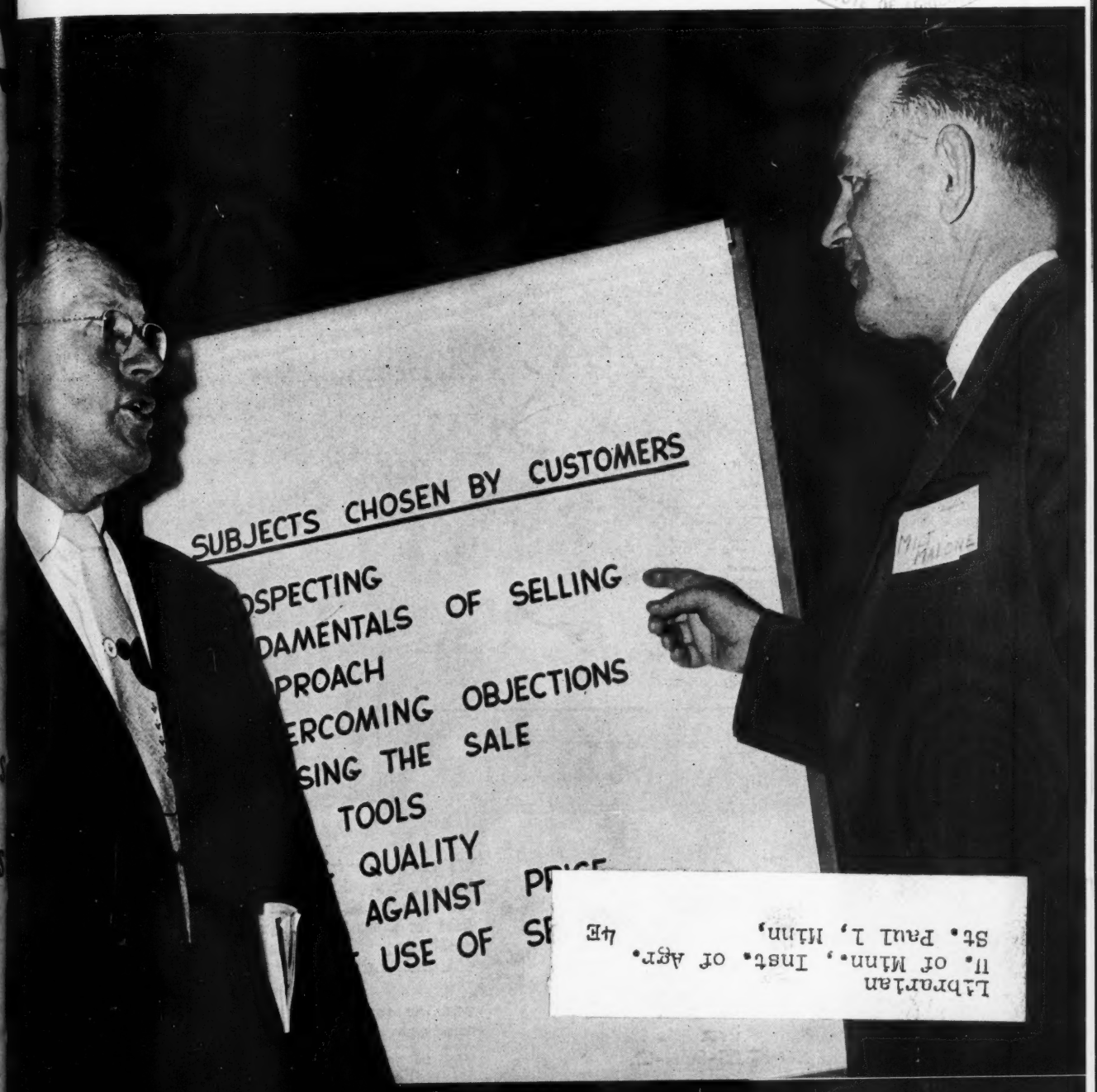

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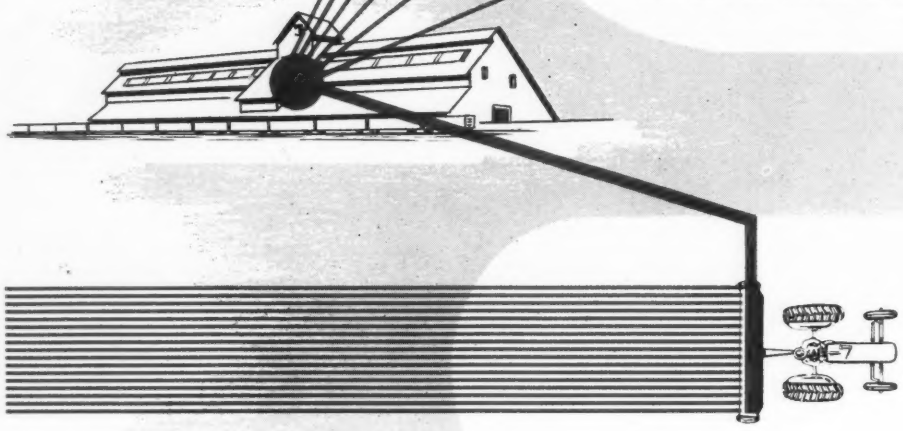

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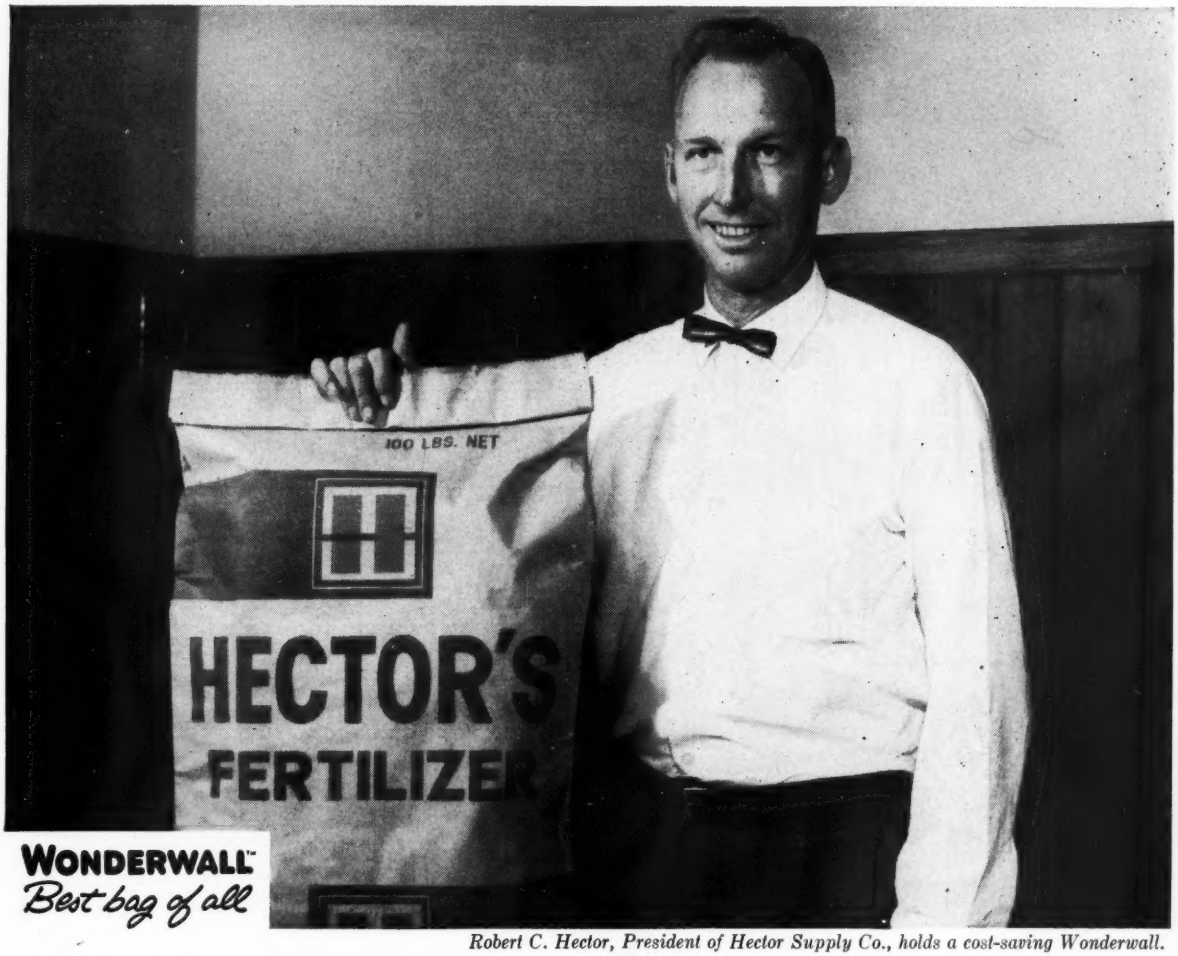

Robert C. Hector, President of Hector Supply Co., holds a cost-saving Wonderwall.

Hector Supply Company of Miami, Fla., operating four plants, produces and distributes fertilizers, feeds, insecticides and plant foods.

President Robert C. Hector found that West Virginia's WONDERWALL measurably reduced his company's bag costs, yet gives better service.

"We were packing 100 pounds of fertilizer in a sewn open-mouth multiwall of natural kraft. This was constructed of 1/90 AL, 2/40, and 1/50 for a total basis weight of 220#," Mr. Hector said.

"When we switched to a WONDERWALL of 1/110 AL and 1/70 construction, we saved 40 pounds in paper basis weight, and that figures out to $7.80 per thousand bags. Equally important, our bag breakage now is negligible".

WONDERWALL bags are better because they're made with Kraftsman Clupak* paper, the tough, impact-resisting kraft with the built-in stretch—pioneered by West Virginia.

Packers of cement, feed, fertilizers, sugar, flour, and many other products are reducing bag costs substantially with WONDERWALL.

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**Clupak, Inc.'s trademark for extensible paper, manufactured under its authority.*

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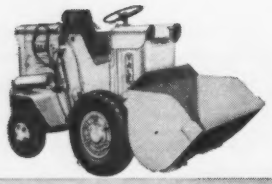

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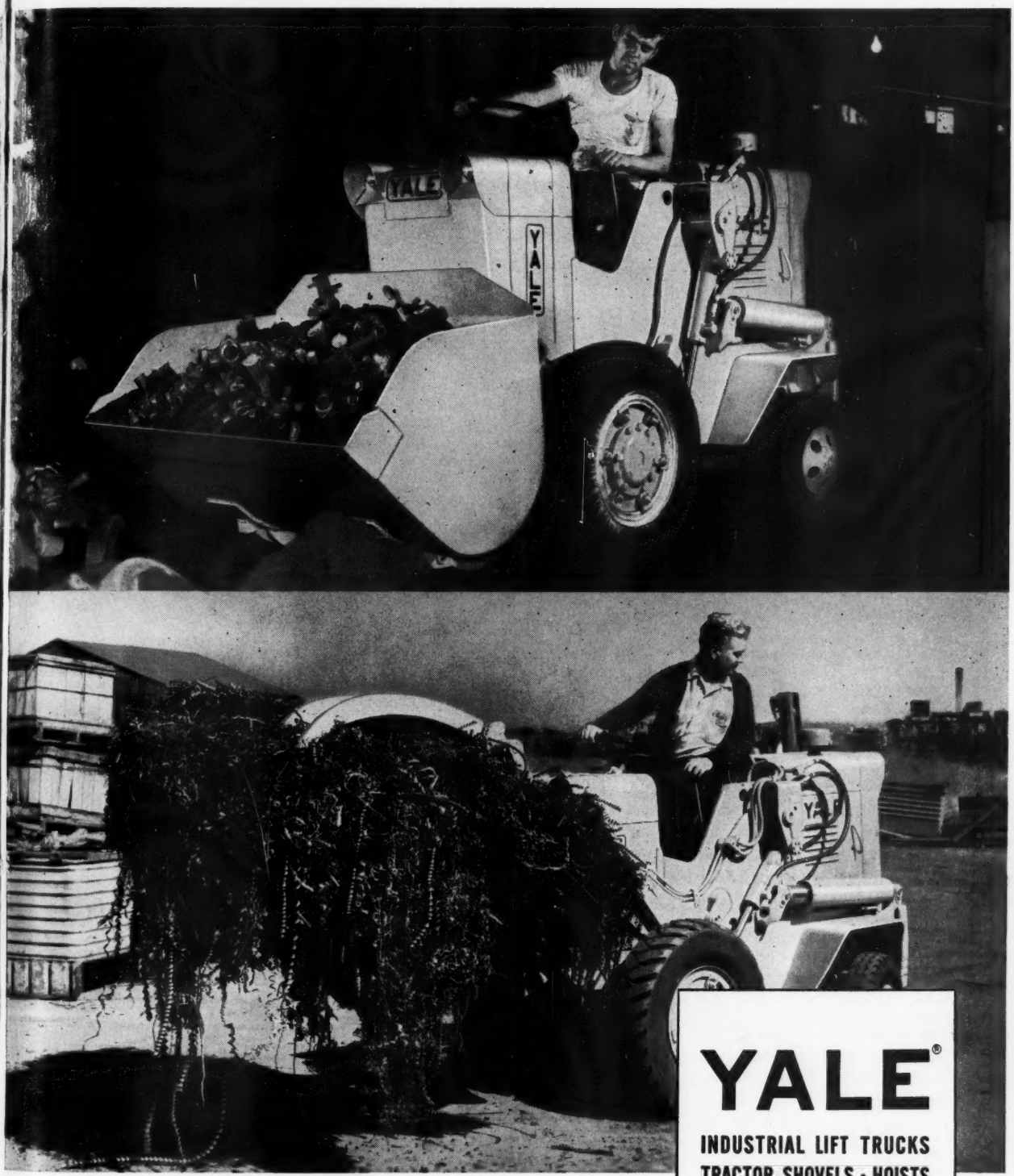

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MEMBER BUSINESS PUBLICATIONS AUDIT

The national business magazine for the fertilizer and pesticide industries, FARM CHEMICALS, serves primarily those persons responsible for management, marketing and production. It has a qualified circulation for selected executive and supervisory persons within specified segments of these industries, as well as in certain closely allied fields. Subscription rates to all others are: in the U.S., its possessions, Canada, Cuba and Panama: $6.00; in other countries: $7.50. Single copy 50 cents. Established in 1894 as *The American Fertilizer*.

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THE COVER PICTURE

Meetings . . . surveys . . . manuals . . . all these are the tools of fertilizer merchandising. F. E. Hartzler brings out what is wrong with fertilizer merchandising on page 25 of this issue and gives readers a new insight into selling today's farmer. This month's cover shows M. S. Malone of Atlanta, a district sales manager of International Minerals & Chemical Corporation, discussing an IMC survey with Ed Reeder of Producers Supply, Inc., Palmetto, Florida.

Photo courtesy of International Minerals & Chemical Corp.

NOW....PROMPT MOLTEN SULPHUR DELIVERIES

Radiating out from Cincinnati

This is the first of the TGS Terminal Molten Sulphur Truck and Rail Distribution Stations being set up to serve industrial areas of the country. Regular large tonnage barge shipments of Molten Sulphur from our mines in the Gulf area are keeping this Cincinnati Terminal well-stocked to meet the growing demand for Molten Sulphur in the Ohio River area.

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LETTERS

F
C

SUCCESSFUL SELLING

Bartlesville, Okla.

We liked Ted Pollock's article, pp. 16–18, June, 1959 issue of FARM CHEMICALS. Please inform me promptly as to the cost of 100 reprints, or if part or all of them can be sent complimentary, we will give them excellent circulation.

Thank you for your contribution to better Farm Chemicals salesmanship.

Very truly yours,
W. E. IRWIN
Manager, Customer Relations
PHILLIPS PETROLEUM CO.

New York, N. Y.

We were very impressed by the article appearing in the July, 1959 issue of FARM CHEMICALS, entitled "The Price is Secondary."

We would be interested in obtaining thirty reprints of this article and would appreciate your advising us of the price.

Thank you for your kind cooperation.

Very truly yours,
B. M. JACOBS
Sales Service Representative
WEST VIRGINIA PULP AND PAPER CO.

Baltimore, Md.

I very much appreciated receiving the articles from your magazine while at the N.P.F.I. Convention in White Sulphur Springs. They were thoughtful and well put together. I find that I have missed a couple of them in the past.

I particularly appreciated the article "Creative Pricing" by Fred C. Foy, and I wonder if it might be possible to obtain a dozen more that I could distribute. I would very much appreciate hearing from you about this at your convenience.

Yours very truly,
BENJAMIN H. BREWSTER, JR.
Executive Vice President
THE BAUGH AND SONS COMPANY

Richmond, Va.

I have just read the second article in a series on "Successful Salesmanship" in the June issue. Reprints of the first two articles and all succeeding ones would be greatly appreciated.

Thank you for your cooperation.

Sincerely,
LEWIS E. GOYETTE
Product Manager
Agricultural Chemical Sales
VIRGINIA-CAROLINA CHEMICAL CORP.

HOW TO REACH EVERETT

Durban, Natal, S. Africa

We refer to your article on "Film Strips Train Salesmen—Up Farm Chemical Sales" which appeared in your journal Volume 122 No. 5 dated May, 1959. We are most interested in Mr. Everett's approach and would be obliged if you could advise us how we can get in touch with him, and whether any of his material is available for purchase.

Yours faithfully,
C. A. JURGENS
FISONS (PTY.) LIMITED

We asked Mr. Jurgens to write directly to Ralph Everett, Empire Sales Training Center, Inc., 443 N. E. 103rd Street, Miami 38, Fla., for additional information.

Holland, Mich.

Will you, please, send me the address of Food Machinery and Chemical Corp., John Bean Division, so that I may contact them regarding the fibreglass tanks mentioned in your "Materials Handling" article in your June issue? Thank you.

Very truly yours,
MRS. ANNE G. STANTON
President
STANTON COMPANY

Address John Bean Div. of FMC at 1305 South Cedar, Lansing 4, Mich.

Memphis, Tenn.

It was indeed good to have seen you at the NPFI meeting at the Greenbrier.

I would like to extend to you my congratulations on the fine job that is being done by your magazine, and likewise to say your editorial entitled "All Barriers To Selling Don't Originate On The Farm" which appeared in the June 1959 issue is indeed an enlightening editorial. I think if everyone in the fertilizer industry would read this and put it into practice, we certainly could upgrade the entire fertilizer industry.

Again congratulations for the good job you are doing, and if you are in the Memphis area any time, we extend to you a cordial invitation to come by to see us.

Sincerely yours,
DAVID H. BRADFORD, JR.
Vice President
MID-SOUTH CHEMICAL CORP.

SALESMEN'S SCHOOL

Raleigh, N. C.

In September there will be a Fertilizer Salesmen's School at North Carolina State College in Raleigh. A copy of the program is enclosed.

We anticipate about 150 to 200 fertilizer salesmen to attend. We believe we have a fine program and set of speakers arranged. The overall objective of the school is to help North Carolina's agriculture through better use of plant nutrients sold and distributed through the fertilizer industry. More specifically, it is to help fertilizer salesmen to do a better job of selling fertilizer . . .

Very sincerely,
W. C. WHITE
Extension Agronomist
STATE COLLEGE STATION

We are publishing Mr. White's letter because we realize the value of such schools and hope many North Carolinians will be there. Among the topics listed on the Sept. 3–4 program are "What is a Good Salesman," "What Are We Selling," "A Farmer's Viewpoint of Fertilizer Selling," "The Sale: Bringing the Customer and Product Together," "Why Should a Farmer Buy Fertilizer," and "Public Relations: You, Your Industry and the Public."

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Mail coupon for L-52 S literature and a copy of "Your Land Is Different" a booklet designed to help you sell more bulk fertilizer.

From ship to train or shoreside storage . . .

TWO MILLION POUNDS OF BULK MATERIAL

handled daily by 8 Michigan Tractor Shovels

On Philadelphia's waterfront, eight high-speed tractor shovels are moving the amazing total of two million pounds of bulk material *every 8 hour shift!*

The machines are 16 cubic foot Model 12B Michigans. Their job, for Independent Pier Co., is to transfer England-imported china clay from temporary shipside hoppers to waiting rail cars and storage bins. Despite the high-volume output, it's not an easy assignment. Material, when disturbed, rises in choking clouds of dust, quickly covering men and machines. Loads must be moved through traffic 60 *to 900 feet*. And all work has to be done quickly to minimize high dock charges.

Under these pressures, Independent Pier has developed probably the fastest operation of its type along the waterfront—built around the speed and mobility of the eight Michigans.

Load-unload cycle averages 58 seconds

Approaching the hopper head-on, bucket skimming the dock, a Michigan in typical operation thrusts into the heaped clay. With flick of tilt-action lever, operator brings up his pay-load. No time is lost in repeated bucking; Michigan's pry-out action heaps bucket in a few seconds. At same instant, a flip of the forward-reverse lever backs the Michigan out of the hopper in a fast, tight turn. In "forward" again, the Michigan races for a boxcar, barely slowing to turn in—even through narrow six-foot doors. To heap

the clay as high as possible in either end of the car, the Michigan charges up the slope as if it were a hill. At top, operator simultaneously dumps bucket and power-shifts into reverse; the Model 12B backs down and swings out the door, ready to repeat the cycle. Operating at top speed through thick dust fog, over round trip haul cycles of 120 to 1800 feet, the Michigans have established a load-unload average of only 58 seconds!

Maintenance, new operators no problem

"Maintenance-wise" says master mechanic Mike Snowden Jr, "there's no comparison between these Michigans and other equipment. They not only need a lot less attention, they're much easier to service. A quick check at lunchtime—mainly knocking dust out of air filters—keeps them in top shape. Ruggedness and ease of operation are advantages, too. Hiring new stevedores every day means new operators for the Michigans—and *could* cause trouble. But new men learn fast on those simplified controls. They don't have to fight a clutch, either, and power steering is a big help pushing around in that clay."

Find out how Michigan ease of handling, speed and dependability can help *you*. Write us any time for complete details . . . or, better still, to arrange a no-obligation demonstration on your job.

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WHAT'S DOING IN THE INDUSTRY

FC

BAUGH BUYS I.P. THOMAS TRADENAME, INVENTORIES

Inventories and tradenames of its I. P. Thomas Div. have been sold by Dixon Chemical Industries, Inc. to Baugh & Sons Co., Baltimore, Md.

Early last year Dixon exercised an option to buy all assets and business of the I. P. Thomas Div. from Pennsalt Chemicals (FC, April 1958, page 30). In an interview with FARM CHEMICALS, (page 21, this issue), the Thomas sales manager, explains why they went out of the fertilizer business.

AAC LETS CONTRACT FOR CONTACT ACID PLANT

C. M. Powell, president of The American Agricultural Chemical Co., announced July 13 the letting of a contract for construction of a three-quarter million dollar contact acid plant at Cairo, Ohio.

Construction of the plant is scheduled to begin early this month, with completion expected in March, 1960. The plant will be capable of producing various concentrations of sulfuric acid.

Powell also announced that construction at the new Agrico fertilizer plant at Johnson Creek, Wis. is proceeding on schedule. First phase of construction, which includes a mixed fertilizer storage building and bag and bulk shipping facilities, is scheduled for completion by November 1.

SHARE OFFER FILED BY SOUTHERN NITROGEN

A registration statement covering a secondary offering of 136,400 shares of common stock has been filed by Southern Nitrogen Co., Inc., with the Securities & Exchange Commission. The underwriting group is headed by Harriman Ripley & Co., Inc.

Representing about 11 per cent of outstanding stock, the shares are being sold by holders; no part of the proceeds are to be received by the company, according to a recent report.

STAUFFER AND VICTOR ANNOUNCE MERGER PLANS

Directors of Stauffer Chemical Co. and Victor Chemical Works reached an agreement in principle for a merger of the two companies subject to stockholder approval, according to August Kochs, chairman, and Rothe Weigel, president, of Victor, and by Christian de Guigne, chairman, and Hans Stauffer, president, of Stauffer.

The merger proposal provides for an exchange of one share of Stauffer common for each share of Victor common. This will involve issuance by Stauffer of about 1,700,000 common shares in addition to the 7,242,670 Stauffer shares now outstanding. The companies reported that it is contemplated that Victor 3½% $100 par value preferred shares will become 3½% $100 par value preferred shares of Stauffer.

Sales of the combined enterprise in 1959 are expected to exceed $225 million.

The Stauffer board will be expanded by addition of three members of the present Victor directorate. The Victor organization will remain intact, with headquarters in Chicago.

T. M. WARE BECOMES CHIEF EXECUTIVE FOR IMC

Thomas M. Ware, president of International Minerals & Chemical Corp., has been made chief executive officer of the corporation by the board of directors. He has been with IMC for 12 years.

Louis Ware will continue as chairman of the board.

NICHOLS FERTILIZER PLANT WILL BE SOLD AUGUST 10

An order by the U. S. District Court Judge, Stephen S. Chandler, has been filed authorizing Nichols Seed & Fertilizer Co. to sell its farm fertilizer plant southwest of Oklahoma City, Okla., by sealed bids. Bids must be filed in the U. S. District Court Clerk's office by 11:00 a.m., August 10, 1959.

Bids on the Nichols plant will be opened at 2:00 p.m. the same day and the plant sold, subject to approval and confirmation of the court.

Earl Nichols, president, said this is the first step in the firm's reorganization plan "to get out of the farm fertilizer business and devote full time to the distribution and production of seeds, agricultural chemicals and allied merchandise for farms and homes."

THIS MONTH'S Meeting Highlights

Northeastern Fertilizer Safety School

Statler Inn, Cornell University, Ithaca, N.Y.

Aug. 12. Topics include "The Scope of Safety Work," by Robert F. Risley, acting dean, New York State School of Industrial and Labor Relations; "Safety Education and Training Fundamentals," Professor Harlan Perrins, of the school; "Personal Factors in Safety—Cases of Unsafe Acts. What Management Can Do to Control and Influence Human Behavior," by William C. Creel, North Carolina Dept. of Labor.

Specific safety problems will be discussed during the afternoon session. Chairman is George Dietz, Fertilizer Manufacturing Cooperative. Subjects: "The Handling of Liquid Materials in the Fertilizer Mixing Program," by Elmer Perrine, Allied Chemical Corp.; "Maintaining Good Order for Safety . . . ", Ed O. Burroughs, Jr., F. S. Royster Guano Co.; "Know Your Accident Programs, Elements, Sources and Effective Measures for Preventing Accidents," Everett Martin, Liberty Mutual Insurance Co.

Aug. 13. "Safety Organization: The Leadership and Responsibility for Establishing an Effective Safety Program," will be discussed by Everett Martin, and Professor Harlan Perrins will lecture on "The Supervisor as a Leader and Teacher: Concepts of Leadership, Teaching Job Skills and Good Safety Habits."

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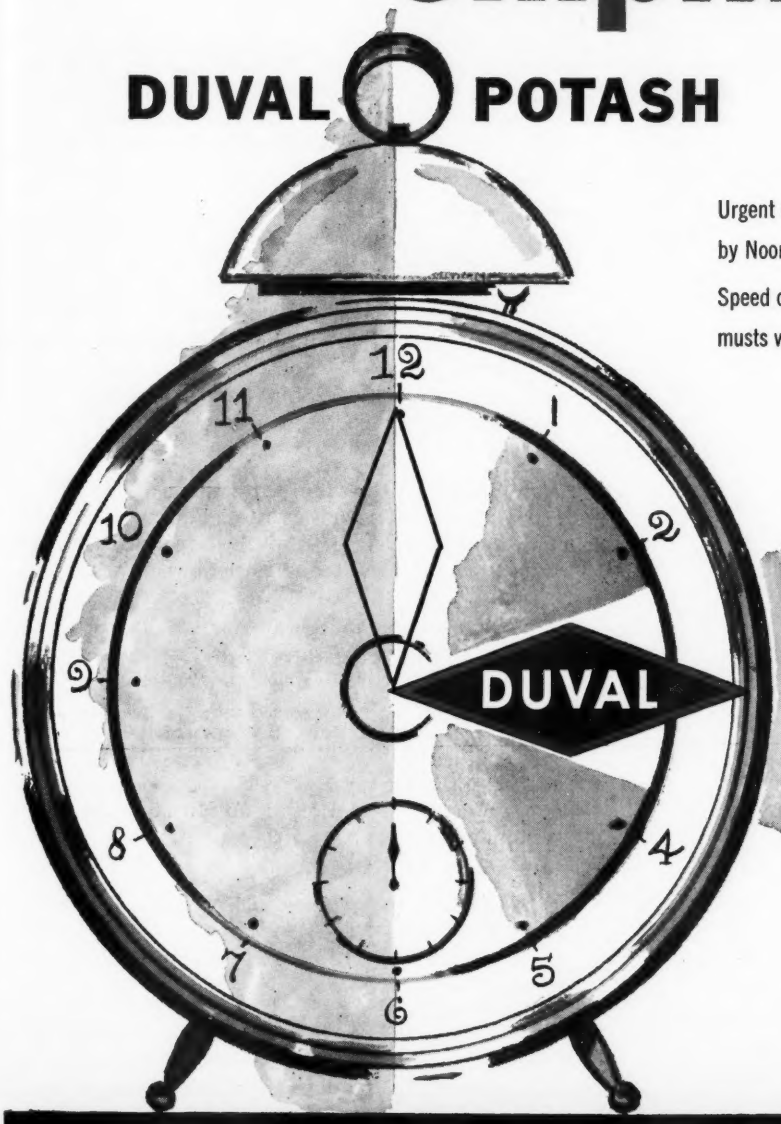

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WASHINGTON VIEWPOINT

▸ *About 5,500,000 acres are to go out of production in the new CR sign-up period.*

▸ *Farm production this year now shapes up to be second largest in the history.*

Conservation reserve sign-up for land to be retired starting in 1960 gets underway in September. Several important changes have been made in the program—which will retire considerably less land than last year.

The Agriculture Department expects to take about 5½ million acres out of production in the new sign-up period, compared with about 13 million last year. This will bring the total retired into the program—for periods ranging from 3 to 10 years—to 28–29 million acres. Congress provided $375 million for the CR for the new program year, but $260 million of that will be used to make rental payments on land signed up in past years. The remaining $115 million is ear-marked for rent and initial conservation practices on land brought in this year.

Here are the major changes going into effect with the 1960 program:

Payments. The national average rental payment of $13.50 per acre stays in effect, but there's a new method of figuring the ceiling on payments per farm. In previous years, total payments were limited to 20 per cent of the actual land valuation. From now on no rental payments will be higher than the local "fair rental value" of the offered acreage based on the average annual crop production from that acreage during the past 5 crop years. This means that in some cases, total payments will be lower than in previous years.

Priorities. Top consideration will be given farmers who indicated a desire to get into the program last year but who were ruled out because CR program funds ran out.

Land eligibility. Another new wrinkle requires that land taken into the CR must have been owned by the offering farmer since January 1, 1956. This is part of the USDA's effort to tighten up generally and close loopholes which have been used for speculation—and have caused adverse publicity. From now on government land and cemeteries are barred from the program.

Land ceilings. For the first time, USDA is imposing a mandatory ceiling on land taken out of production in communities and counties. No more than 25% of eligible land in any community or county is supposed to be retired. This is to prevent adverse effects on county and community economies resulting from too much farmland going out of production. The ceiling, however, can be lifted depending upon evidence and testimony of non-farm businessmen that more retired land would not upset local business.

Whole farms. The USDA again is stressing the retirement of entire farms into the CR. USDA believes it gets more actual crop production cuts this way. Last year, ¾ of offered land was in the form of whole farms. Whole farms account for about half of the 23 million acres already in the CR. USDA figures the CR has taken 3.2 million allotment-crop acres out of production since the beginning of the program in 1956.

Next year. The CR now is at the cross-roads. USDA must soon decide whether to make it a major surplus-reducing program, or just to let it drift. With this year's sign-up, the program will have about half the 60 million acres experts say is needed to bring farm production into line with demand. From now on, USDA experts say, the program could absorb more productive land—after having retired a large proportion of the poorer crop land during the past sign-ups.

The $50,000 price support limit established this year by Congress is loaded with significance for future farm legislation. It goes much deeper than merely imposing some loose loan restrictions on a few big producers.

As the first effort to legislate a price support ceiling, it establishes the key principle that such restrictions are not to upset orderly marketing of farm products. It does this by preserving the long-established legal tradition that all production of price supported commodities shall be eligible for price support loans. The fact that this now is the law records it as the intent of Congress. As a result, any future attempts to limit price supports are likely to be based on the principle of full-crop support.

As the law is now written: No producer can get more than $50,000 in price support *non-recourse* loans from the government. (Non-recourse loans are the usual support loans whereby a farmer can keep the loan money by turning over title of his collateral crop to the government). But producers can get any amount above that figure on a *recourse* basis—if they promise to repay all above the $50,000 in cash within 12 months of the loan date. Furthermore, the $50,000 limit does not apply for farmers who cut their crop output by up to 20% (or whatever lesser percentage USDA sets). Such farmers can get unlimited non-recourse loans.

The ceiling covers only those commodities which the Secretary declares specifically to be in surplus supply. Crops likely to be so declared include cotton and wheat, and possibly corn and tobacco. Based on 1958 production, the $50,000 limit would affect the following number of farms and estimated output in excess of the limit: *Cotton*, 2,000 farms, 950,000 bales; *wheat*, 600 farms, 8½ million bushels; *corn*, 102 farms,

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Florida Pebble Phosphate Rock • Superphosphate
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All grades of Complete Fertilizers • Keystone® Gelatin
Bone Products • Fluosilicates • Ammonium Carbonate
Sulphuric Acid • Phosphoric Acid and Phosphates
Phosphorus and Compounds of Phosphorus

THE AMERICAN AGRICULTURAL CHEMICAL COMPANY · AA QUALITY · REG. U.S. PAT. OFF.

GENERAL OFFICE: 100 Church Street, New York 7, N.Y.

What's Coming Next Month

You meet some interesting people writing for an industry as dynamic as the farm chemicals field. It's easy to see why some concerns are successful and others are just making the grade . . . when you observe the *personalities* of top management. Motivation has come in for a lot of play in this magazine recently. Much more of this sort of editorial material is being planned for future issues. But we don't expect these articles to work miracles overnight. There are too many immovable barriers. You probably have your share of them right within your own company.

■ THE HAYES-SAMMONS STORY

What's a better way to acknowledge the achievement of hard-working division heads within your organization than listing them in the telephone directory? This is just one of many motivating factors behind the success of Hayes-Sammons Chemical Company, Mission, Texas. Next month, we're going to bring you the story of the marketing program that brought about such a staggering increase in sales in just four years. Established as a hardware store back in 1905, this company boosted its farm chemicals sales from $2.6 millions in 1954 to $8.5 million last year!

■ SERVICING "FUTURE BUSINESS"

What is a "complete" fertilizer service? Does it pay to service farmers who don't buy from you? You may not agree with the philosophy of this fertilizer company, but when you take a look at their record you'll have to admit "they've got something."

■ MATERIALS HANDLING IDEAS

Our materials handling section will bring you a report of some of the new equipment and labor-saving ideas which agricultural engineers have been "dreaming up." This is definitely one of the bright new areas of the farm chemicals picture.

. . . in the new

FARM CHEMICALS BPA

WASHINGTON VIEWPOINT

820,000 bushels; and *tobacco*, 250 farms, 450,000 pounds.

Congress this year provided a total of just under $4 billion for USDA's regular activities, corporations and related agencies, for the July 1, 1959–June 30, 1960 fiscal year. This is $110 million less than USDA requested, and $842 million less than was spent in the year which ended last June 30.

Compared with last year, the new agency appropriations are: Agricultural Research Service—$67.7 million, compared with $63 million. Payments to States for Experiment Stations—$31.6 million, same as last year. Extension Service—Payments to States, $53.7 million, same as last year. Soil Conservation Service—$133 million, compared with $135 million last year. Soil Bank—$375 million for the Conservation Reserve, compared with $786 million last year. The big cut is due to the demise of the Acreage Reserve last year—which paid high per-acre rates to retire allotment cropland for one year. Agricultural Conservation Program (ACP)—continued at the full $250 million rate for another year, over demands of the USDA to limit payments to $100 million.

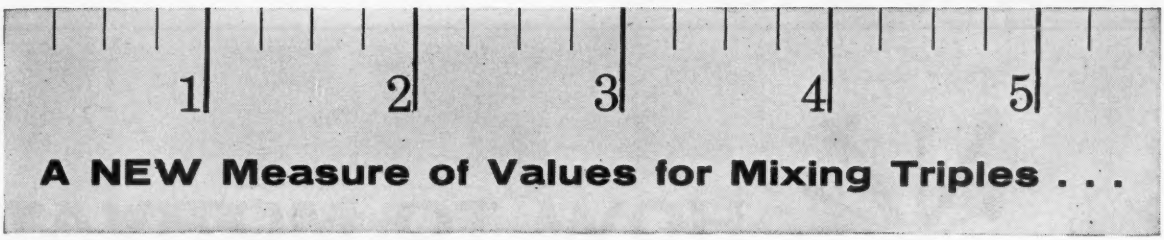
Total farm production this year now shapes up as the second largest in history—less only than the amazing total 1958 outturn. Actually, USDA reports that 1959 output is only 5% less than last year when ideal weather conditions helped farmers shatter all records.

Big news: Corn. USDA is forecasting by far the biggest corn output in this country's history—4.2 billion bushels. This compares with the record of 3.8 billion bushels established last year.

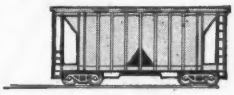
USDA makes its first official estimate of the cotton crop in August, but its July planted-acreage report shows 15.9 million acres to be harvested this year. This compares with the 12.4 billion acres of last year. Wheat this year is being harvested from 53 million acres, about the same as in 1958, with a crop of 1.2 billion bushels indicated, compared with 1.4 billion last year. Soybean acreage is down from last year's record 24 million to this year's 22 million acres. Tobacco acreage is up slightly—from 1.1 million acres to 1.2 million.

Businessmen against supports. The Nation's businessmen, whether they agree or not, now are on record as favoring an end to all federal farm price support programs—except in times of depression. The National Chamber of Commerce, which says it speaks for 2.7 million businessmen, called on Congress to "end farm price supports" as the best solution to the "farm problem."

C. of C. spokesman Walter Garver, said the businessman's answer to the farm problem is 1) removal of all supports and controls, 2) keeping government-held surpluses off the market temporarily, 3) stepped up sales of new farming techniques to reduce production costs, and 4) training and employment services for farmers "who will be displaced."

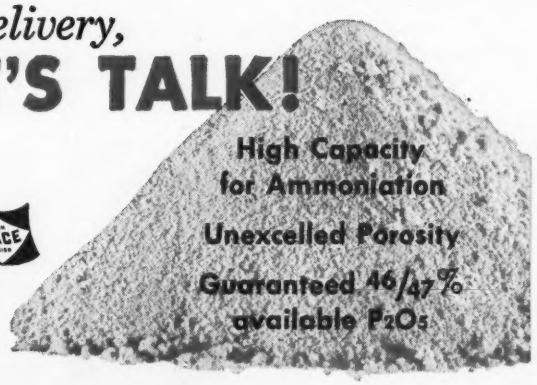


A TEST CARLOAD

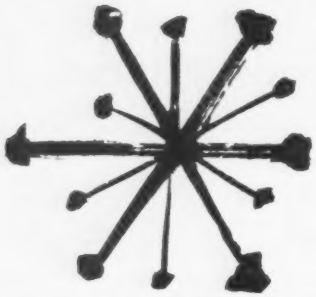


OF NEW DAVISON HI-FLO RUN-O-PILE TRIPLE SUPERPHOSPHATE IS THE ONE SURE WAY TO PROVE TO YOURSELF THAT HI-FLO CAN SOLVE YOUR MIXING PROBLEMS

. . . whether they be quality, delivery, dependability or service. **LET'S TALK!**



W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND



HOW TO MOTIVATE S

LAST MONTH'S first installment of this two-part article stated the need for incorporating three principles in your management philosophy. Restated briefly, these principles are:

Principle One. By making full use of the cumulative and latent know-how of the people in your organization, you get a result that is highly superior to that obtained without its full use. The successful application of this principle requires a *sincere belief* that this is so!

Principle Two. Only procedures and situations which provide *believable anonymity and an equally believable probability that ideas and opinions will be used*, are capable of pooling the best individual thinking that is available in any group.

Principle Three. To find out from your people how an objective can be accomplished, you must first develop and understand the underlying problems and difficulties before you can intelligently shape tasks and programs that will lead you toward the objective. Thus, never confront your people—in a sales meeting or otherwise—with an objective. Rather, after establishing the objective, invite them to deal with a *target* that is expressed as a *problem*, and then pool the thinking present and accessible to define and clarify the problem.

PRINCIPLES TO METHODS TO ACTION

If you will accept that carrying these three principles into action can achieve beneficial results for your company similar to those other companies have obtained, how will you apply the proper methodology next Monday—or a week from Tuesday—when the heat is on you to stop merely trading dollars and start making a profit? Alright, here is your step-by-step procedure.

First, your policy-making and program-planning management group clarifies the objectives of a project, and then translates them into a clear target, which is a summary problem statement. The objective may be to increase sales by 20 per cent this next quarter, selling at list price with no cutting, special deals, or give-away credit terms.

Second, your management group decides what individuals to involve in the pooling of ideas, experience, thinking, good will and—yes, enthusiasm—who would contribute and are expected to be involved in the subsequent implementation of the pooled ideas, know-how and experience. Participants may include your entire sales force, your top management group and individuals in middle management even if they are only indirectly involved in the marketing function. On whatever geographical basis it would be practical to do so, you may want to involve distributors, dealers and applicators.

Thirdly, upon careful preparation, you organize one or several group sessions in which these participants undertake a "difficulty analysis," by means of a *written conference* that provides unlimited opportunity for bringing out the many ideas heretofore arrested in some such way as your salesman telling his wife, "I don't know why this blasted company doesn't do this, that or the other." A session may consist of three one-half hour, or two three-quarter hour writing periods, interrupted by "buzz" sessions, in which an oral cross-fertilization of participants' thinking takes place.

Fourth, you follow up the "difficulty analysis" sessions with "solution statement" sessions, held in exactly the same way. Again, participants offer their best thinking, this time addressing themselves to the best solution of the target details previously clearly established in the difficulty analysis. Do not commit the fallacy of proceeding with the "solution statement" sessions right away, as you won't get sharply edged thinking without an adequate and clearly understood

Erwin H. Klaus is a marketing executive who has long been known for his innovations in agricultural marketing. Until recently with the J. B. Hill Co. Division of Balfour, Guthrie & Co., Ltd., he is now with the international management consultants firm of Ernest L. Loen & Associates, where he is in charge of agricultural accounts with headquarters in Fresno, California, also called "the agribusiness capital of the world." For many years he was marketing director of Northrup, King & Co., where he initiated and directed that seed firm's highly successful marketing program.

By ERWIN H. KLAUS

E SALESMEN

statement of the problem. Some have tried to avoid the "difficulty analysis" session in order to save time, and found they had indeed wasted time.

Fifth, the collected data from both sessions are organized by categories, and analyzed. You may wind up with anywhere from twenty to fifty categories. They usually include such as how to persuasively demonstrate user benefits . . . how to get dealer cooperation . . . how to induce dealers to sell at a profit (providing you don't give the stuff away in the first place) . . . how to hold effective dealer or farmer meetings . . . how to make the advertising support the selling effort . . . how to set sales quotas . . . how to arrive at an incentive payment formula fair to both company and men . . . and possibly why effort and results are lagging because of poor policy and program, or because the vice president in charge of sales or some district manager is a s.o.b., and what to do about it. Should part of the objective—i.e. a specific task—be the need for a sales manual, you'll find from the analysis of the data that the men have written the sales manual they need, and all you have to do is to put together what they have said they need and want to use. In sum total, you now have a detailed action guide for management's decision making and program planning. As the program emerges—frequently not all at once, but in different parts at different times—participation continues because the men will accept it as *their program with a feeling of proprietary ownership.*

Thus they have the strongest possible motivation for doing their part in carrying it into fruitful action, for wanting to excel, for wanting to make yesterday's excellence today's minimum.

IDEA ENGINEERING

The principles and methods stated in this and in the preceding article (*July, 1959* FARM CHEMICALS, *page 20*) are called *idea* engineering. While idea engineering has been successfully practiced by companies in many industries, to my knowledge it has not been employed by any farm chemicals manufacturer. This gives any company in the industry an excellent opportunity to score a *first* and get ahead of the competition. But should *you* decide to put idea engineering to work and find out that a competitor has preceded you, don't let that stop you, for the fertilizer industry needs to raise its level of marketing performance throughout. In fact, you will find that as the quality of competitive marketing performance increases (and price cutting and ridiculous credit terms are not quality but the opposite of quality), *your* profit opportunities will increase—but only if, as the slogan of that old Milwaukee brewery states so succinctly, you *move up to quality.*

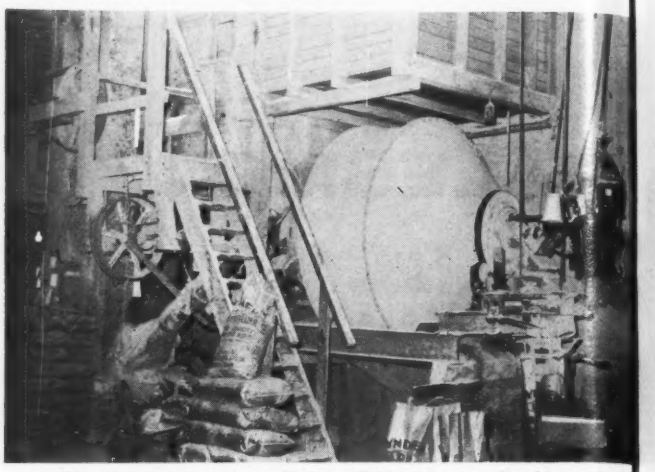
Idea engineering does not replace poor management. Rather, it demands improved management performance, management bent on innovation, willing to learn, to test, to try out, to grasp how to use the idea engineering tool, maybe a bit amateurishly the first time, with much improvement the second time until it becomes an expert at it. Profitable results from idea engineering are guaranteed by its effective implementation of the overriding principle that *nobody* knows as much about the goals, tasks and problems confronting a particular business than the individuals associated with it.

To again quote from Dr. Russell Coleman's nail-on-the-head-hitting statement in the NPFI's FERTILIZER SALESMEN'S HANDBOOK, "the fact that the barriers to proper fertilizer use have been so strong means only one thing . . . we haven't been communicating with our customers." As many ways lead to Rome, there are many ways of effective communication with customers, with dealers, inside your own organization. One sure way is to put idea engineering to work. Then *you will be communicating with your customers. You will get your message across, persuasively, to all who matter.* ▲

to sell more fertilizer at a profit

PART 2. A step-by-step procedure to help you put into action the three principles of idea engineering, which are practiced successfully by firms in many industries.

Lynden Department Store's Fertilizer Division:



The mixing set-up, where all of the LDS brand is mixed and bagged

AN EXPERIMENT BECOMES A

By HOMER HATHAWAY

IT HAS OFTEN been said that well-known brands, which have been on the market for years, could probably quit their huge advertising campaigns and coast along for years on the initiative of past reputation. Nobody has had the courage to test this idea, and certainly the Lynden Department Store in Lynden, Washington, isn't going to be the first.

When I was told that a department store was a supplier of farm chemicals I was frankly doubtful, since it seemd somewhat incongruous for a retailer of everything from dresses to foodstuffs to be selling fertilizers across the counter on the same basis. LDS doesn't exactly sell it across the counter, but their fertilizer operation is certainly an important part of their overall sales picture, and they keep it important in that picture by SELLING their product. They definitely don't coast on their reputation, nor do they sit back and wait for business to come to them.

The Lynden Department Store was started as a typical country store back in 1897 by W. H. Wappels, but it was not until in 1920 that they found themselves in the fertilizer business. At that time they received a direct import of 300 tons of German potash, and even though it took them two years to get rid of it, they decided that this was just one more service they could offer to their farmer customers, so they stayed in it. The business has thrived ever since.

The physical set-up of the plant is comparatively small, with a one-ton mixer handling the entire mixing operation, but they put out between 3 and 4 thousand tons every year, with the bulk of their business coming in the spring. And all of this is bagged fertilizer. The LDS warehouse and mixing operation is several blocks from any railway spur, and they have found that bagging their product, and buying bagged fertilizers of other brands, has worked out best for them, since all of their hauling must be done by truck.

The actual consulting services which they offer to farmers is limited, since they have no outside salesmen. However, through Mr. Lyman Judson, general manager of the store, and William Bode, foreman for the past ten years of the fertilizer division, any farmer is welcome to consult and get answers to any problems confronting him.

And these men keep up on latest trends in the industry so that they will be able to give intelligent advice to their customers. They attend every conference in their area where advances in farm chemicals

Lyman Judson reads beside a stack of the LDS brand

Outside loading platform of the LDS fertilizer warehouse

S A SUCCESS

are discussed and explained, and early in the spring they send out a letter, plus 6-8 pamphlets to each of their customers, informing them of such advances and letting them know what will be available for them that year.

Since Whatcom county is the largest dairy community in the state of Washington, the bulk of the fertilizer business is done in pasture work, and of course, most of this comes in the spring, after the first crop has been cut. Mr. Judson said that farmers are increasingly going to high analysis fertilizers—the 10-20-20 and 6-20-20 groups, where the cost is cheaper per unit and the farmer can use less bulk to cover a wider area.

Their farmer customers do all of their own work, since LDS has not gone into the application end of the business, although they do much custom-mixing.

They have about 12 different formulations of their own registered with the state, and these are sold under their own brand—LDS. Actually, although this stands for Lynden Department Store, the residents of the area refer to it more familiarly as the Little Dutch Store. In that reference "Dutch" lies much of the success of the LDS brand.

About 60 per cent of the population of the area is of Holland Dutch descent, people who possess an intense loyalty, but who are also thrifty, and demand the most for their dollar, in fertilizers as much as in everything else. The LDS brand has given them that value, and has continued to hold their business because of the friendly, helpful attitude of the LDS people.

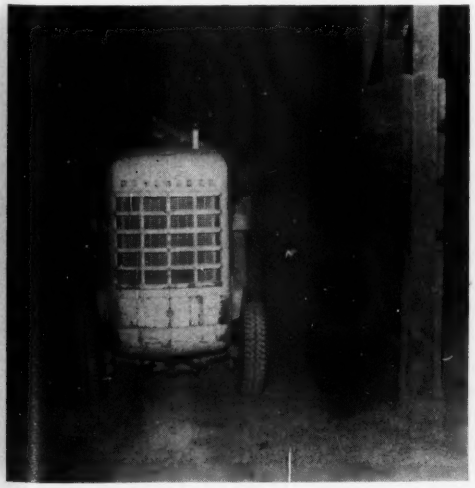
The total tonnage of the LDS has not increased spectacularly over these past few years, although the total nutrients have jumped considerably, due to the use of the above-mentioned higher analysis fertilizers. But in a set-up like LDS maintains, the three to four thousand tons they mix each year is an excellent return on their investment.

One other method is used by LDS to secure new accounts, although word-of-mouth advertising does much of this job successfully, and that is through newspaper advertising and the employees in the warehouse itself. Products in the area which are also considered good prospects for LDS brands are seed potatoes, strawberries and raspberries, all early summer crops.

So, what started out in 1920 as an experiment has developed into a substantial, and important, part of a general store business.

What can today's fertilizer mixer learn from an operation like this? He should be able to see that personal service in any size operation is an important ingredient to growth and success, while the reputation of a company, no matter how long it has been in business, is only as good as this year's advertising and sales efforts. ▲

Storage bins for materials used in custom mixing. Materials are loaded into the mixer by the Payloader shown.



Section of the warehouse showing stored bagged fertilizer

18 TELEPHONE SHORTCUTS TO SALES

How to invest dimes to make dollars is revealed in this, the fourth in an FC series on "Successful Salesmanship"

By TED POLLOCK

ITEM: a top fertilizer salesman for an Eastern firm upgrades two out of every five orders—yet seldom leaves his office.

ITEM: the sales staff of another company has increased its actual selling time by some 20 per cent, comes to work no earlier, leaves no later than usual.

ITEM: one inventive salesman has found an almost sure-fire way of convincing skeptical prospects that his fertilizer will do all he claims it will—for a top cash outlay of 30 cents.

The secret?

In each case, an educated forefinger.

Properly used, it can tap a prospect on the shoulder even though a continent separates him from you . . . point out the benefits of your product while your competitors are knocking on the prospect's door—even turn the clock back (or forward) in your favor.

It can do all this—and more—on one condition: that you apply it wisely and often to the dial of your telephone. For the salesman, Mr. Bell's magic box can mean tripled prospect coverage, lower costs per sales call, bigger sales.

And here's how.

1. Eliminate ice-cold calls. According to a survey conducted by *Nation's Business*, 17 per cent of a salesman's selling day is spent simply waiting to see prospects. That's about 200 costly hours a year down the drain forever.

Frequently, that precious time is lost because the salesman is on a cold call, has to twiddle his thumbs until all the men *with* appointments (including competitors) have had their interviews and the prospect is free to see him.

A simple phone call—in which you identify yourself, your firm, the nature of your proposition and request an appointment—allows you to arrive just minutes before the prospect expects you. Other advantages: he tends to remain uncommitted to the competition until he's heard your story, *you* can screen unprofitable visits in advance and avoid unnecessary travel expenses.

2. Solicit orders. If your product is inexpensive, uncomplicated or well-known, try selling it *directly* by telephone. The law of averages dictates that the more people you contact, the more sales you will make. And you can talk to five, ten—even fifteen—times as many people as you can visit in a day. Besides, you cash in on impulse buying, reach out-of-the-way markets, cover your present market more intensively.

Suggests the American Telephone & Telegraph Company: "Be sure you have a 'conversational hinge' on which to turn your sales talk—a current advertisement run by your firm that the prospect has probably seen, a news item of interest, a problem you know the prospect is facing."

3. Answer questions. It's a rare prospect who has no reservations about your product or service. Lay a solid foundation for a sale by first sending him a detailed letter in which you explain what you have to offer and inform him that you will telephone in a day or two to answer any questions. On the specified day, call. Because he knows that he will hear from you, the prospect will usually study your proposal and thus expose himself to it.

4.Use the "skip-stop" sales plan. This is how it works: on one trip, the salesman actually visits only a portion of his prospect list; he contacts the others by telephone from nearby stop-over towns. On his next trip over the same route he reverses the procedure,

calling on those clients he telephoned before, and telephoning those he visited.

This method greatly increases the size of the territory a good salesman can cover, yet keeps him in regular touch with every prospect on his list.

The effectiveness of the plan, of course, depends on pre-planning. The sales visits and the telephone calls should be scheduled with extra care. In addition, savings can be made by devoting extra study to the selection of a central and convenient calling point for each client along the way.

5. Give him the low-down. One salesman advises: "There's real money in making a beeline to your telephone whenever you've picked up some tidbit of information from your company—at a sales meeting, for example. No matter what's been discussed—new packaging, price changes, delivery schedules—somewhere there is at least one customer who will want to buy more as a result of the change. Get in touch with him. Matter of fact, you have a good excuse for calling up all your customers. It's amazing how often a switch in company policy, put in terms of increased benefits, can whet a customer's appetite. And don't overlook the dramatic impact of being able to say, long-distance or cross-town, 'Here's the scoop—straight from our sales meeting!' "

6. Say "Thanks." You receive a whopping order from a customer in Virginia . . . an account in Kansas gives you a lead that pans out solid gold . . . an Iowa prospect turns customer. Why not dial your gratitude pronto? You'll stand head and shoulders above the competition in the recipient's estimation. An inexpensive courtesy call is not only good manners —it's good business.

7. Settle delinquent accounts. It's a fact: collection letters accomplish little; when they do, they're apt to create ill-will. Print is cold; the human voice, warm. A personal phone call tactfully implies the proper degree of forcefulness and urgency, eliminates an extended correspondence (most points can be covered in one conversation), swiftly permits you to reach the person with the authority to discuss the problem.

8. Turn inquiries into sales. Your firm has run an ad in a trade publication. Ten of the subsequent inquiries fall within your territory. You *could* wait until other business calls you to the vicinities in question. You *could* send a form letter to each of the ten. You *could* dictate ten personal letters (two hours' work? three hours'?)

Instead, how about striking while interest is at the sizzle stage, by getting on the phone—right now? Use any other method and you risk giving your prospects a "cooling off" period during which their interest and enthusiasm may wane.

9. Get on-the-spot testimonials. Printed testimonials aren't always convincing. Next time a man doubts your claims, try the technique one salesman has found over 60 per cent effective: "Mr. Clark," he says, "I'll tell you what you can do! Right now and at my expense, please call any or all of these three users of our fertilizer and ask them what they think of it. I'll leave the room while you do." Even those prospects who don't take his offer are impressed.

10. Get critical OK's from your company. A sales representative for a chemicals company was on the verge of the biggest deal of his career. Question: could his firm guarantee delivery within the week? A quick telephone call to the home office—collect from the prospect's farm—got an affirmative reply and the order was signed. Time lapse between question and answer: less than five minutes.

Unexpected bottlenecks can frequently be unplugged on the spot by telephone. And your customer is bound to be favorably impressed by your "get-things-done" approach.

11. Soothe ruffled feathers. That order you wrote up three weeks ago hasn't arrived yet . . . a favorite customer is the mistaken recipient of a dunning letter from your credit department . . . shipping has sent the wrong order to a prime account. What to do?

Advises a sales manager: "A man with a gripe needs someone to listen to him, not a pen pal. Get on the phone as soon as you can and get him to tell you the entire story. Encourage him to spell out the details. Let him recount every gory point. Ask questions until he really talks himself out. Be sympathetic. When he's finished—really finished—and gotten everything off his chest, repeat his complaint so that he knows you've paid attention, understood and cared. Make the necessary apologies and ask him to tell you how he'd like you to rectify the error. In a surprising number of cases, you'll find that just by listening, you have turned bull-like anger into something resembling reasonableness. Then offer him the very best satisfaction you can."

12. Pat him on the back. Has a customer come up with a prize crop? His kid win that college scholarship? Did he finally buy that strip of land he's been ogling for years? By all means, call him up and congratulate him. It's good public relations—and the kind of gesture that sticks in the mind.

13. Cancel cancellations. Sometimes they're unavoidable; sometimes they're not. You can find

PHONE-SIDE ESSENTIALS

To be sure your telephone selling runs smoothly, here is a list of materials to have within reach before you start dialing:

- ▶ Binders containing lists of customers to be called.
- ▶ Catalogs, brochures and price lists.
- ▶ Copies of recent company advertisements.
- ▶ Telephone directories for all exchanges to be solicited (available from your telephone company).
- ▶ Display board on which are listed current stock conditions, items to be featured, specials, shipping schedules.
- ▶ Pertinent correspondence with customers to be called.
- ▶ Notebook and pencil.

out exactly which kind you're dealing with, quickly, by phone. Perhaps the customer needs to be re-sold. Maybe he misunderstood your terms. Possibly, it's a mistake. A call can provide reassurances, clear up uncertainties. At the very least, you may be able to salvage something out of the cancellation—a smaller order, a future commitment.

14. Take advantage of time differentials. The telephone can not only transcend space, but time as well. A Pennsylvania salesman of a big-ticket item, for example, sells for three additional hours daily by calling West Coast propects from 5 to 8 p.m., Eastern Standard Time (2 to 5 p.m. in the West) without interfering with his local routine. By the same token, Western salesmen can profitably call cross-country as early as 6:15 a.m.

Depending on where you work and where you call, you can add one to three hours of productive selling time to any working day. Just pick up the receiver.

15. Replenish your prospect list. Sooner or later, it happens to every salesman: a lead shortage. What faster way to add "live ones" to your list than to buzz satisfied customers and ask for names?

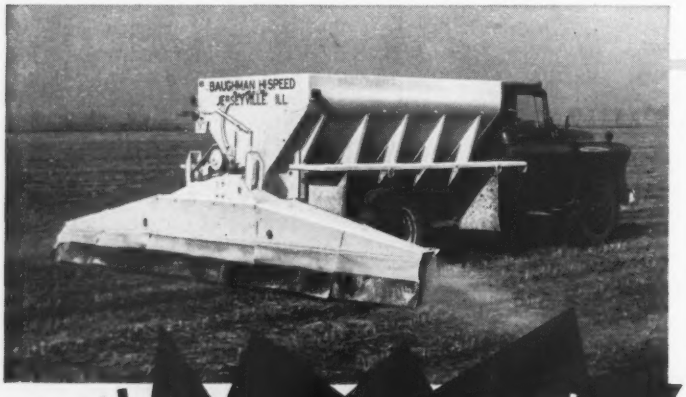
16. Sell products while they're en route. A cancellation arrives in the mail after the order's been shipped. Under those circumstances, many companies have trained their salesmen to get on the phone and canvass other potential customers in the general vicinity of the shipment's original destination. Frequently, a customer is found for whom the merchandise is sheer manna. Saved: the expense of having the shipment returned, attendant paper work, a sale, good will all around.

17. Upgrade sales. "Just received your order. Thought I'd call to remind you that if you increase it by three tons, you'll be entitled to a four per cent discount." "The word is out—prices will rise two dollars a ton next month. Add 10 more to this shipment?" "On checking your order with last year's, I notice it's 20 per cent smaller. Is there a special reason or could it be a mistake?"

By pointing out an unknown or overlooked factor to a customer over the phone, you can sometimes get him to boost the size of his order—and earn his gratitude to boot.

18. Increase repeat sales. Western Union calls up senders of birthday and anniversary telegrams 364 days after the original message was sent to remind them that that special occasion is rolling around again, offers to take another greeting over the phone. Florists, jewelers, department stores make memory-jogger calls to harried husbands who might otherwise forget their wives' birthdays, their own anniversaries.

It's a good idea. Have a customer who ordered around this time last year, but hasn't gotten in touch with you yet? Call him up and tell him so. It could be an oversight, one he'll be grateful to have pointed out to him. ▲



NEW! A BAUGHMAN EXCLUSIVE!
Lube-Impregnated Chain Drive
on the K-5
Lime and Fertilizer Spreader

Advantages of New Lubrication Feature:

- *Positively Insures Greater Corrosion Resistance*
- *Virtually Eliminates Chain "Freezing"*

Baughman K-5 Spreader Body Also Features:

- Tough 40,000 lb. test malleable block chain (total strength) . . . strongest ever used for spreader body discharge.
- Belt Conveyor Discharge (if preferred).
- Choice of four drives.
- Reinforced top edge, extended side jacks and internal bracing for full body support . . **STRONGEST SPREADER BODY EVER BUILT!**

Better Service Through Better Engineering.
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I. P. Thomas sales manager explains . . .

"WHY WE WENT OUT OF THE FERTILIZER BUSINESS"

EXCLUSIVE INTERVIEW

IT CAN'T be said that the I. P. Thomas Division of Dixon Chemical Industries, Merchantville, N. J., didn't know how to sell fertilizer. The esprit de corps of what Robert McCormick, general sales manager for the Division, termed the "best doggone sales force in the fertilizer business" left nothing to be desired. And the new Technical Service Department designed "to give farmers more field and laboratory help in fertilizer selection" was producing results.

But less than a year after the announcement of the new service program, Dixon is out of the fertilizer business. A news release recently reported that Baugh & Sons, Inc., Baltimore, oldest fertilizer company in America, purchased the I. P. Thomas tradenames and inventories (see page 8).

20% INCREASE IN SALES LAST YEAR

The ironical fact is that the Division had reported increased sales of close to a million dollars since the new program was started, with a whopping 20 per cent increase in fertilizer tonnage moved onto customers' farms.

I. P. Thomas, acquired by Dixon from Pennsalt Chemicals Corporation marketed more than 50 grades of fertilizers and specialty mixtures in the Middle Atlantic States. Fritz Anspach, a Rutgers graduate in soil chemistry, had been made manager of technical sales and service for the division.

What really happened? Here is the interview which FARM CHEMICALS conducted with Bob McCormick just before going to press.

Q. *Mr. McCormick, how long has I. P. Thomas been in the fertilizer business?*

A. 91 years.

Q. *How would you have ranked I. P. Thomas as far as size before the sale to Baugh & Sons?*

A. Medium sized producer with distribution limited to the Middle-Atlantic States.

Q. *How was your sales picture this past year, compared to other years, say the past five?*

A. 1958–59 was the best sales year since 1952.

Q. *Mr. McCormick, what were the principal reasons for Dixon going out of the fertilizer business?*

A. Our initial objective after acquiring the I. P. Thomas Division from Pennsalt Chemicals Corporation was to build a completely integrated fertilizer operation with captive sources of raw materials. This would have lent itself very well towards our contemplated heavy chemical expansion program at Paulsboro, New Jersey. The capital expenditures involved in accomplishing this objective could not be justified on a long term basis because of the extremely illogical selling policies prevailing in our area. Absurd pricing and indiscriminate poor judgment in extending credit terms with which we were forced to be competitive tells the story.

Q. *You stated that you could not service many farmers because of "bad economics." Elaborate on this.*

A. In order to provide the farmers with the type of technical service required, an extensive organization is necessary. For example, we had one man who actually went into the fields, took soil samples in the proper way and forwarded the results of these tests to our agronomists for recommendations to the farmer. We estimated that each sample taken (at no cost to the farmer) cost approximately $1.50 for each soil test alone. This did not include the salaries of the personnel required to perform this service or other incidental expenses such as traveling, etc.

Many farmers took advantage of this service and then advised us that if we wanted to be favored with their business we would have to meet the competitive prices of manufacturers, who did not provide this degree of service.

It is apparent to me that the farmers want this type of service and need it very badly to efficiently operate their farms, but neglect to consider this in their evaluation of supplier merit.

Q. *You feel that to compete with cooperatives, an independent must control its sources of raw materials. Please explain.*

A. The fertilizer manufacturer should control a large portion of the raw materials required, i.e., phosphate rock, sulfuric acid, nitrogen compounds, etc. Diversification must be present to provide additional sources of revenue during the "off season."

(Continued on page 24)

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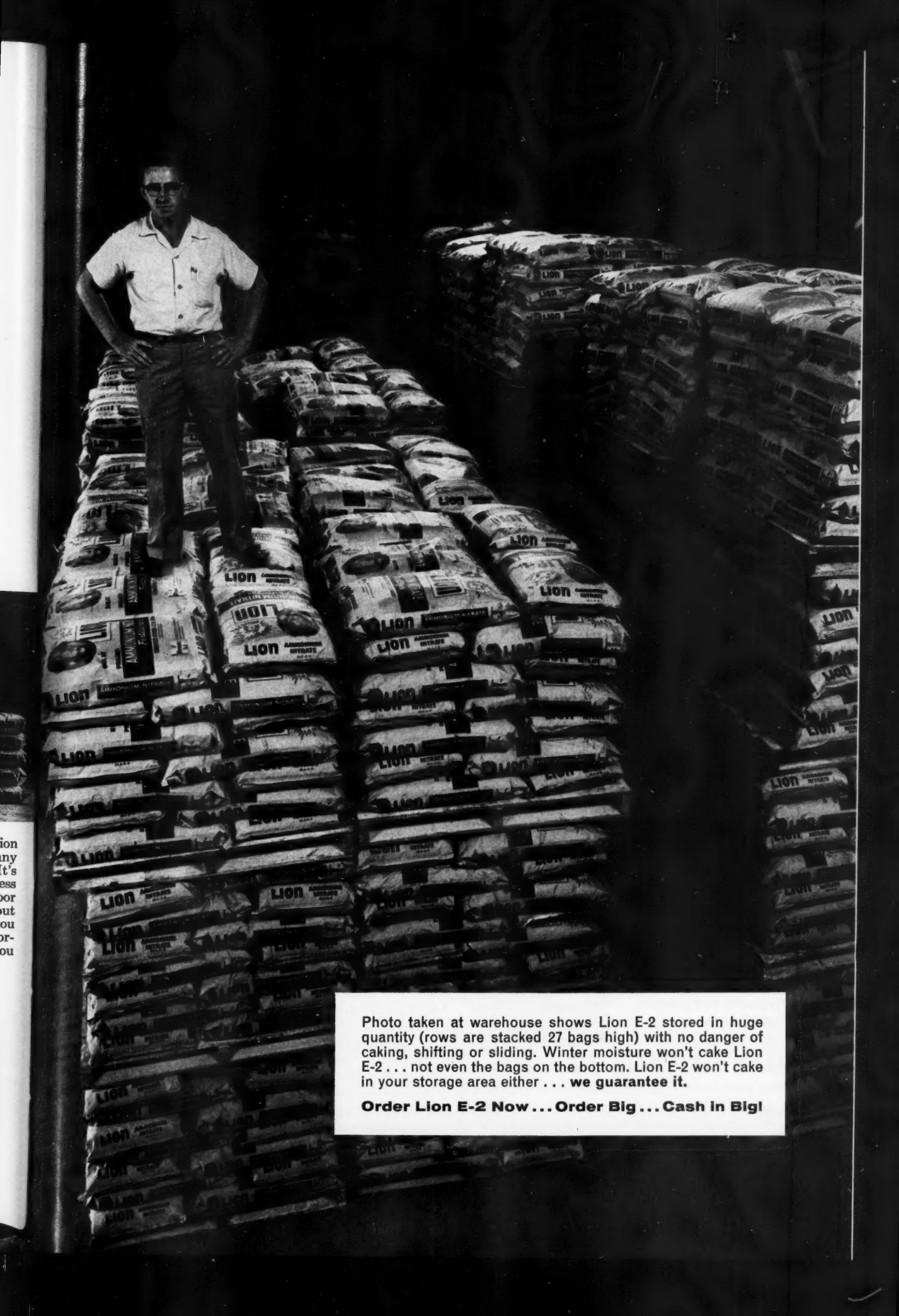

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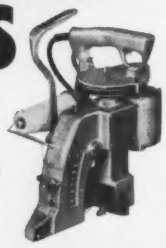

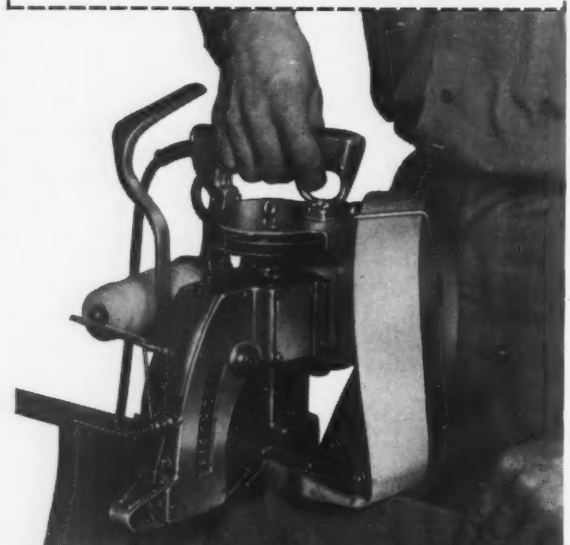

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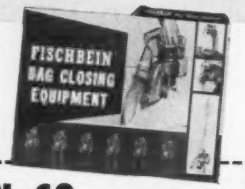

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MARKETING

"WHY WE WENT OUT OF THE FERTILIZER BUSINESS"

(Continued from page 21)

Q. *Do you feel that you had an integrated marketing program? Please explain your program.*

A. Our marketing or selling program was quite simple:

1) We supplied a complete service to save money for our customers by recommending specific changes in fertilizers, fertilizer ratios, dosages, proper use of agricultural chemicals, etc.

2) We tried to give the fastest possible service and extended ourselves to have on hand at all times anything that a farmer might need.

3) The initiation this year of our News Letter Program attempted to drive home the message that our paramount interest was in putting more money in the hands of the farmer through the methods described above, thereby meriting his loyalty as a fertilizer and agricultural chemical supplier.

Q. *Do you think that your increased farmer service program with free soil testing, etc. did the job you expected it to do? How much did it cost per ton of fertilizer and how much additional business did it bring in?*

A. Our increased farmers' service program certainly did the job we expected it to. The increased sales testified to that fact. It is very difficult to place a cost increment per ton of fertilizer produced but I would say that it cost our firm approximately $40,000 additional per year even though our program was in its infancy. I could not say exactly how much additional business was due to our service program but have reason to believe it was a major factor.

Q. *Considering that your projections into the future took into account such things as a better educated, more sophisticated buyer, higher income per acre, bigger operation, etc., did you still come to the conclusion that the buyer of the future would be a member of a cooperative?*

A. The membership in a cooperative, if it is a "true" cooperative, is a very valuable thing to a farmer. A "true" cooperative, as I interpret it, is one where a member contributes to the operation of his organization both financially and by participation in their programs. One case in point is the tremendous progress in the dairy industry made possible by the dairy cooperatives. There a dairy farmer receives dividends because of his actual participation in the cooperative program as outlined above.

The cooperative movement the fertilizer industry is faced with is fundamentally a sales organization patterned after the currently very popular discount house with the *major* object a lower cost on the basic product and nebulous direct benefits to the farmer himself in terms of service.

The current projection in terms of future fertilizer sales and production has been estimated by various agencies and indicates that by 1970 more than 75 per cent of the fertilizer sales in the United States will be sold through the "cooperatives." This fact paints a very dire picture for an independent company.

"Clean up" Your COMMUNICATIONS

By F. E. HARTZLER

AFTER having written advice by the carload on fertilizer problems, I sat down in the living room with a pot of coffee, a cigarette and a typewriter to consider once more the major problems of the industry.

In any such study, you will agree, the first thing to do is to get a clear picture in mind of what is now true.

THE MARKETING STRUCTURE

I have a great respect for census data in studying any marketing pattern. The 1954 census is out of date, but until the new one comes out, it is the best information available. It took a little figuring, but when I was through I had a table that set the data out where I could work with it.

PERCENTAGE OF RETAIL SALES

Type of Store	Community Size			
	Under 5,000	5,000-49,999	50,000-499,999	500,000- & over
Gen. Merchandise	48.36%	30.50%	12.24%	8.87%
Farm Equipment	65.11	28.09	6.10	.55
Hay Grain and Feed	63.59%	26.65%	8.23%	1.42%

Now, if you will take just a moment to look at this you will notice that for these three lines nearly two-thirds of the total volume is moved in towns of less than 5000 population. In the next category nearly one-third of the merchandise is sold in towns from 5000 to 50,000. For all intents and purposes, people selling merchandise to farmers are going to have to be in reasonably small communities; this pattern, at least, seems to be pretty well established, and it is sensible.

The next question is: Just what size business sells the most merchandise to farmers in each of the three categories? Now let us cut this one a little finer, because it is an important piece of information.

PERCENT OF TOTAL SALES VOLUME FOR THREE MAJOR LINES OF RETAIL BUSINESS SELLING FARMERS

Type of Business	Number of Employees					
	0-3	4-9	10-19	20-49	49-100	100 over
Farm Equipment	27%	43%	18%	12%	—%	—%
Gen. Merchandise	33	18	16	21	6	6
Hay Grain and Feed	29%	38%	19%	11%	3%	—%

Here the figures clearly show that the majority of sales to farmers is made by stores with less than nine employees.

From the two charts we can get a good idea of the structure of the dealers who are selling fertilizer to the farmer as well as the general farm market structure. The sales will be made by small stores in rural areas or in small cities. The new census will be out soon, and it will be interesting to see the changes. I do not think that these will be very great, however. This is the marketing structure that the industry will have to live with and improve.

THE PRODUCT

Essentially fertilizer is a good product. It is not quite as spectacular as seed corn, but it is a good product. The only thing wrong with it is that it takes a certain amount of know-how to use it properly.

The product used correctly will return close to a hundred per cent profit on the original investment; since this is for a six months period in some cases, this makes the return two hundred per cent a year. A figure that no other business can match.

Actually, however, the product is secondary to the skill and judgment of the person or persons using it. This is unfortunate, as I will discuss later, but obvious. For example, the right quantity at the right time, applied in the proper manner is more important than the brand used. This means that the dealer and his judgment are of primary importance.

This has been largely overlooked as people go around the country shouting the slogan, "a pound of nitrogen is a pound of nitrogen." Change this to, "a pound of woman is a pound of woman," and you can see the foolishness of it. This suggests that you might as well marry a four hundred pound woman and get a bargain as to marry a skinny one weighing one hundred and eight pounds! Obviously the woman who has the latter number of pounds in the right place and in the right proportions is a much more satisfying woman. The same can be said for the proper distribution of fertilizer. It's a horrible comparison, I admit, but it points up the moral.

Fifty tons of fertilizer dumped on a five acre plot is wasted, just as an imbalance or too small an amount is, in a sense, wasted. The problem is to get the right amount and the right kind. It is unfortunate that the methods of soil testing have not been made more accurate, as this seems most important as a step toward that goal. But to reiterate the initial point, the product is a good one and *it can be sold.*

So to summarize, we have an industry marketing structure that is reasonably well established and permanent over most of the country. We also have a

good product, although it requires skill and judgment in its use. What is wrong?

COMMUNICATION TO THE CUSTOMER

Every merchant swears that his customers are different and that all his problems are in that one factor —the customer. However, to a real extent, this is true of the man selling the farmer these days. He does have a customer problem. The fertilizer industry really has one.

Now, one of the great advantages that merchants have is that they usually take their customers as they are. They do not intend to reform, re-build, or even re-touch them. They have very candid eyesight, these merchants. But the fertilizer industry neither sees his customer for what he is nor accepts him.

There is a reason for this—the agricultural men in the colleges came from the farm, most of the dealers came from the farm, and many of the men heading the manufacturing end came from the farm. Consequently they can not see the farmer as he is. They see him as "father," "mother," or "grandfather." They see him with affection; they may even see him as the proto-type of some vanquished American virtue. This is fine, but it is poor business.

Therefore, let's look at the farmer—as he is, not as we would like him to be. This may hurt, but it is a fairly accurate picture. Military records reveal that the farmer is less healthy than his city cousin, less educated, and subject to higher rejection rate. The National Plant Food Institute study revealed that the non-user of fertilizer is probably one of the least educated large groups in America. Now education and intelligence are not the same. We know that half of our best brains do not go to college. But the kind of knowledge that is needed to handle fertilizer such as biology, physics, chemistry, and perhaps bacteriology is almost the same thing—at least it is usually obtained through higher education.

Since we can not send all the non-users back to school to catch up, the industry must do the next best thing—provide education of a kind, themselves. The customer can't be changed, so the thing to do is to change the communications from industry to consumer. The Department of Agriculture has long realized this; some of the most readable material ever written has been written by that department for farmers. It is beautiful clear prose.

With the National Plant Food Institute Study in mind, put yourself in the shoes of the ordinary farmer to whom the dealer is trying to sell fertilizer. You, as the farmer, have been making less money every year now for the last six years. From 1940 to 1948 you made more money than you thought possible. You were the king of the walk. Today you are doing the same thing you did then, but somehow you are being squeezed out.

If you have never had any economics you can not understand the farm problem and, realizing this in a vague way, you don't try. It is easier to blame someone and the easiest person to blame is the politician. He's handy. Then here comes a salesman who tries to tell you how to make a profit. He talks about nitrogen, phosphate, ammonia, and if these terms were not confusing enough, he adds something about pounds of N. If you have never had chemistry, biology, or physics, what goes through your mind when he talks about elements, bacteria, decomposition, or organic matter?

You need help to make your farm a going business, but are you going to trust a person you can not even understand? A salesman who likely has never farmed, himself? In fact this man who is offering to help is only adding to the sense of despair that is already becoming overwhelming. You don't have a chance and spending money you would have to borrow doesn't seem any nearer to the answer.

WHAT TO DO

Back when I was debating in school, old Doc Pflaum used to tell us to take our case out and tell it to a six year old boy. When that boy nodded his head that he understood, the case was clear. To a degree this is the advice that I would give the industry. Clean up your language. Get it down to earth. Suppose that you had never had high school chemistry or biology and somebody were to mention elements, trace minerals, pounds of N, phosphorous, sodium, phosphate, sulfate, what would go through your mind? I mean it, what would those terms mean to you? Let me give you a list from my field to emphasize that point a little more: respondent, operant, SH_4, SD_3, a pursuitmeter, stylus maze, reminisscence phenomena, retro-active inhibition, proactive inhibition, reactive inhibition and so on. In ten minutes I can have you staggering under just a few simple words—simple to me—but I won't win your confidence with this sort of thing; I will only make you mad and distrustful.

HOW TO BEGIN

To start with every company should review its own advertising and get rid of any words that a man who has never had special education wouldn't know. Then every advertisement should be designed so that it stresses a person, not a piece of farm equipment. Ads might show a farm auction with farmer Jones watching sadly, using the theme, "I tried to tell poor ol' Joe to fertilize, but he just wouldn't do it." The industry as a whole should unite in one theme for all advertising that would sell one idea: Fertilizer pays! The Dairy Industry has set an excellent example of just this policy.

From somewhere some easily understood figures for increasing farm net income must be made available to dealers. Some accurate methods of soil testing must be developed that are reasonable, quick and as simple to use as possible. The dealer must be trained so that he will be able to estimate crop yields for normal conditions and predict income levels for various applications of fertilizer. The process must be simplified and it must be understandable to the farmer. It must be in terms of profit and income. The reason that you have a chance with the dealers is that there are only about 80,000 of them as contrasted with the several million farmers. Start your education plans with the dealer; he in turn can reach the farmer, his customer, and reach him intelligibly. ▲

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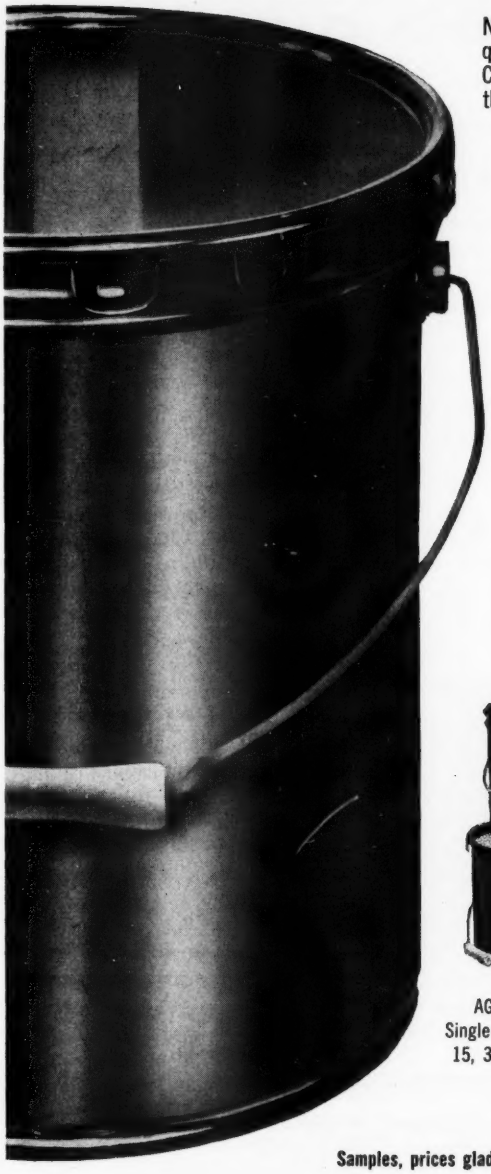

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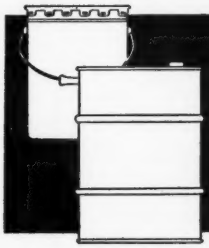

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When will farm chemicals come into their own

Farmers are rapidly discovering the economic basis for farm chemical use. When will they decide that fertilizers and pesticides constitute the most important items on the farm? A prominent economist gives some of the answers.

By C. O. McCORKLE

THE QUESTION you and others in this industry have been asking "longer than seems necessary" is finally receiving some answers.

When will farm chemicals gain equal status with the other productive factors employed by farmers?

That's an involved question, with many direct but even more *indirect* answers. Concerning the latter, we must take into account the vast education job still to be done, the many changes taking place in farm management, and need for additional studies to determine the long-run economic health of both the farmer and the suppliers of farm chemicals! These problems are just as important as the present farm chemical use patterns.

BUT THE PICTURE IS BRIGHT

For the "direct" answer on fertilizer, take the booming 300 per cent gain in plant nutrients added to crops from 1935 to 1957, inclusive!

What about pesticides? To the individual farmer, the use of chemicals is now planned along with that of land, labor, machinery and other capital items. Take California—In 1957, cotton farmers spent $38 on chemicals for each acre tilled. This was 33 per cent of the total *pre-harvest* and 22 per cent of the *total cost!* Chemical costs run even higher for such crops as pears and peaches. In the latter crop, total pre-harvest and harvest cost per acre for chemicals ran to $400 per acre. (See table 2)

Thus it's easy to see that fertilizers and pesticides are assuming more of a major role in agriculture. Today's farm managers are profit-minded and are *reorganizing the profit opportunities* offered by economic use of farm chemicals. There's no doubt about it—present materials which are set to be adopted and new materials still on the planning board will give farm chemicals equal status with any of the other productive factors in farming.

ROOM FOR EXPANSION

Admittedly, the rate of increase in fertilizer use has slowed recently; however, a continued increase is anticipated because of the relatively low cost and high rates of return on money spent on plant food.

Further research in progress on a nationwide scale will no doubt contribute substantially to expansion in fertilizer use.

Increased use of pesticides in agriculture to control diseases, harmful insects, weeds and other pests is equally striking. Yet, there is vast opportunity for profitable expansion in on-farm use of these materials.

The most recent comprehensive study of losses in agriculture indicate that the average annual loss from

* *Associate professor of agricultural economics, University of California, Davis.*

TABLE 1

Disease and Insect Losses in American Agriculture, Average Losses Per Year in Terms of Value of Production by Commodity Groups 1942-1951

Loss due to	Commodity groups: Field, forage, pasture, & range	Fruit and nut crops	Vegetable crops	Dry crops and ornamentals	Total
	1	2	3	4	5
			Thousands dollars		
Diseases	$2,802,119	$ 94,310	$353,990	$ 82,811	$3,333,230
Insects	841,902	97,051	139,527	76,647	1,155,127
Total	**3,644,021**	**191,361**	**493,517**	**159,458**	**4,488,357**

Source: U. S. Department of Agriculture, Agricultural Research Service in cooperation with other departmental and federal agencies "Losses in Agriculture" A Preliminary Appraisal for Review ARS-20-1, June 1954. Washington D. C.

diseases and pests in the period 1942–1951 was nearly 5 billion dollars. (*Table 1*).

This estimate is in terms of value of production lost. While substantial improvements in control measures have been developed, the value of losses has probably not declined proportionately. Higher value for the products lost today offset in part any reduction in physical loss.

In addition to insect and disease losses which can be reduced substantially by the proper application of pesticides, it has been estimated that the average annual loss in value of production from weeds in crops was about $1.8 billion and in pastures and ranges nearly $.5 billion for the same 10-year period. There should be little doubt concerning the opportunities available for profitable application of chemicals in control of insects, disease and weeds.

CHEMICALS AS PRODUCTIVE FACTORS IN AGRICULTURE

In many cases the farmer has discovered for himself the economic basis for farm chemical use.

Three types of questions face the farm manager with respect to the use of chemicals: (1) how much should he use in each specific instance? (2) how should the dollars available for carrying on the farming operation be divided between chemicals and other inputs such as labor and machinery? and (3) what modifications in the use of chemicals are necessitated by elements of uncertainty that plague agricultural production?

The question of how much to apply can best be approached by considering the economic basis for fertilizer applications. Where single nutrients are involved, as a general rule, the farmer can make the most money from his fertilizer dollars *if he attempts to continue adding units of fertilizer until the last dollar's worth of fertilizer applied produces approximately a dollar's worth of added product.*

Most farmers do not fertilize at this rate, the common practice being to fertilize at a lesser rate. Limited capital, yield and price uncertainty, and lack of knowledge of responses to fertilizers are important reasons for their underfertilizing.

A recent USDA study indicates that on intertilled crops in the United States the average return per last dollar spent on fertilizer was about $3.40 in 1954.[1] On close growing crops and hay and pasture the estimate was $1.96 and for all crops and pasture the return was estimated at $2.93.

Though increased use of fertilizers in the past five years has undoubtedly reduced these differences, the data suggest that many farm managers are either failing to take advantage of the profit opportunities presented or lack the capital necessary to do so.

Where multiple fertilizer inputs such as nitrogen and phosphorus are applied, the greatest profit from fertilization is attained when the added products from the last dollar spent for each of the nutrients are equal to the ratio of their respective prices to that of the product.

In practice this principle serves as a basis for estimating combinations of nutrients to use, though detailed information is seldom available to permit the precise adjustment suggested. It clearly demonstrates however, that in determining fertilizer practices the manager must consider not only crop responses but must consider *relative costs of the nutrients* and the *price* he expects to get for his product.

THE FARMER'S OTHER DECISIONS

Determining amounts to apply, whether considering fertilizers or other chemicals, is only a part of the decision that the farm manager must make. In addition, method of application, timing, placement, sources of materials and other decisions are required. Since cost and response may vary with each method of application or type of material, rates of application cannot be determined independently. The alert farm manager is aware of the complexities and is able through careful budgeting to select rates approximating the most profitable level.

In addition to considering combinations of nutrients, the farm manager must also consider substituting between chemicals and other inputs if he is interested in keeping his costs at a minimum for given production levels. For example, chemical weed control in crops or on ranges, in place of mechanical treatment, has in many cases reduced production costs. In other cases, fertilizer inputs have been used to increase production of forage for livestock and reduced either direct feed purchases or eliminated the need to rent additional land. Thus, most profitable use of production capital in today's farming operations may likely involve considerations of using farm chemicals together with or in place of other inputs.

Adjusting operations to uncertain conditions is one of the major functions of the farm manager and most

[1] U. S. Department of Agriculture, Agricultural Research Service, *The Economic Position of Fertilizer Use in the United States.* Agricultural Information Bulletin No. 202, Washington D. C., November 1958.

TABLE 2

Relative Importance of Agricultural Chemicals in Producing Selected Crops in California, 1957

Crops	Total pre-harvest cost/acre	Cost of agricultural chemicals/acre: pest & disease control	fertilizer	other	Total cost of chemicals per acre	% Chemicals of total pre-harvest cost	Total pre-harvest & harvest cost per acre	% Chemicals total cost
	1	2	3	4	5	6	7	8
Cotton	$115	$10	$22	$6	$38	33%	$175	22%
Rice	45	4	4		8	8	75	11
Sugar beets	95		15		15	16	135	11
Alfalfa	48	5	8		13	27	85	15
Peaches	265	35	15		50	19	400	12
Pears	173	40	15		55	32	315	17
Tomatoes	90	7	15		22	24	248	9
Lettuce	116	10	17		27	23	[a]	

[a] Usually harvested by the shipper.

farmers are continually seeking means of reducing the impact of uncertainties. Farm chemicals have provided part of the answer.

Insect and disease sprays developed in recent years have permitted the producer to insure against heavy crop losses from these causes. Though they have increased the cash costs of production, dusts and sprays have paid handsome dividends particularly to producers of intensively cultivated crops. But, as has been suggested, not all the pests and diseases are, or even can be, controlled with present knowledge and materials.

As in the case of any input in agriculture, its unwise use can be costly. Overfertilizing dryland grain in dry years, spraying with inappropriate materials and damaging plants and animals are but two examples of poor management of these important factors.

CHEMICALS IN SELECTED TYPES OF AGRICULTURE

Profitable management of chemicals in farming varies in large measure with the type of agriculture and location. Physical characteristics of an area—soils and climatic conditions particularly—set broad limits on the products that can be produced and determine in part the kinds and amounts of inputs and practices required. The types of crops and the cropping systems further affect practices and strongly condition the use of chemicals.

Farmers in the western Great Plains would be highly reluctant to fertilize grain crops—although they might profitably be fertilized in the Corn Belt where rainfall is more certain, or in the Imperial Valley of California where soil moisture is almost completely controlled through irrigation and drainage.

The uncertainty in rainfall in the western Great Plains thus restricts the use of chemical fertilizers on dry farmed grain below levels that, on the average, might prove to be profitable. But, while average incomes over time might be enhanced, greater variability in income would likely accompany heavier fertilizer applications in this area. Farmers with limited capital reserves are usually willing to sacrifice some income in the interest of greater stability.

Fertilization of western rangelands is another example of relatively intense management through chemicals of an extensive type of agriculture. Net incomes in livestock production in some areas of the West have been enhanced by proper management of fertilizers. Under appropriate conditions they can be used to increase total forage production, to obtain earlier spring feed, to lengthen the growing season, to alter the plant composition by applying materials that encourage growth of desired species, or to change the nutritive content of the feed.

With the introduction of chemicals, the opportunities available to some livestock producers are greatly increased. Management of grazing livestock has thus intensified in several areas of the western United States where soil and climatic conditions permit the use of agricultural chemicals in modifying forage production.

In contrast, producers of high value intensively cultivated crops tend to follow fertilizer and pest control practices approximating the physical limits to insure a high yield and high quality product. This is particularly prevalent in the irrigated regions of the West where vegetables, fruits and other intensive crops are grown. High land values, specialized equipment, market contracts and technical "know-how" in the production of specialty crops further necessitate the widespread use of chemicals in agricultural production in such areas.

Control of soil borne diseases and pests and rapid break-down of crop residues are problems that chemistry in agriculture is meeting. Reliance on rotations as a means of checking disease and insect buildup is often not economically feasible.

The role of farm chemicals in an intensive agricultural area is illustrated in the production of eight irrigated crops in California (*Table 2*). Costs estimates and the practices and inputs from which they were derived are typical of commercial operations in the irrigated valleys. The costs of chemicals per acre in the production of four field crops (cotton, rice, sugar beets and alfalfa) varied between $8 and $38, the highest being for cotton. A third of the preharvest costs and nearly a quarter of the total costs of production for that crop (not including land changes) go for chemicals

While chemical costs per acre are higher for the two fruit crops (peaches and pears), other costs are proportionately higher, resulting in a distribution of costs between chemicals and other inputs similar to that prevailing for the field crops. The high costs for disease and pest control materials is typical of the fruit crops.

Outlays for chemicals in vegetable production are illustrated by the tomato and lettuce cost data. Expenditures for fertilizers and pesticides representing nearly 25 per cent of the preharvest cost are quite typical for these high value crops.

Regardless of type of farming or location, the increased use of chemicals in agriculture has increased the scope of management. Aside from problems of selecting chemicals, methods of application and substitution among practices that have been introduced, equally important problems of toxicity in soils, plant and animal damage, regulation of application levels and materials that can be used, and residue tolerances arise.

PROFESSIONAL ASSISTANCE PAYS OFF

Where fertilizer application rates are held at near maximum physical levels for several successive crops or for a rotation involving two or more heavily fertilized high value crops, toxic buildups of injurious salts have been experienced.

The farm manager must be able to either recognize the presence of these conditions at their inception or be willing to hire professional assistance.

Within speciality crop areas, limits on spray residues on vegetables and fruits, particularly for fresh consumption, are carefully established and enforced for the protection of the consumer. Substantial financial loss to producers and shippers because of improper spraying practices has been incurred.

Between the extensive and intensive types of agriculture discussed lies the vast majority of American agriculture. The Corn Belt and the South make up the bulk of the diversified crop and livestock type of agriculture in which the application of chemicals, particularly fertilizers, has advanced markedly.

Yet, opportunities exist for further increases in the use of fertilizers and other chemicals in these regions. In 1954, only 60 per cent of the corn acreage harvested

had been fertilized.[2] In that year the marginal return to fertilizer on corn was estimated to be $3.06 per $1.00 invested. With 58 per cent of the cotton acreage fertilized in the same year, the marginal return to fertilizer was estimated at $3.39. Today, the proportion of the acreage fertilized is much greater and the marginal returns unquestionably lower.

Thus, while chemicals have widened the profit opportunities in all types of agriculture, they have increased the demands on the farm manager. While alarming to some less well acquainted with agricultural trends, these increased demands for wise decisions are completely in keeping with the shifting emphasis toward greater commercialization in the agricultural segment of our economy.

MANAGEMENT DECISIONS AND AGRICULTURAL CHEMICALS

Decision-making is recognized as the central function of management in commercial agriculture today. In making decisions farmers must rely on a wide variety of information sources. As production technology has advanced the farmer's sources of information have of necessity broadened.

A recent study sponsored by the National Plant Food Institute indicated that today's farm manager, regardless of geographic location, relies heavily on commercial sources of information in determining fertilizer practices.

While not examined, similar findings would be expected with respect to information on use of pesticides. Nearly one-third of the farmers contacted discussed their fertilizer needs with local dealers; less than one-fifth approached their county agents.

Yet, almost three out of four farmers reported the country agent to be their best source of practical fertilization information.

Manufacturers' salesmen were rated as a best source by 5 percent and as a source of information on individual problems by only 3 per cent. The role of the manufacturers' salesmen may well increase as farm size increases and further steps toward commercialization are taken.

That farmers look toward commercial sources in large part for information in the use of farm chemicals is understandable. Often the recommendations made by manufacturers, distributors, or their representatives are those developed by research personnel in agricultural experiment stations. Companies with sufficient volume to support internal research groups obtain equally competent persons to conduct and evaluate research.

COMPANY RESPONSIBILITIES ON THE INCREASE

As farm managers employ increased quantities of "off-farm" goods and services in keeping with advancing technology in agricultural production, the responsibilities of commercial organizations through their farm representatives increase proportionately.

Recommendations can no longer reflect only the desire to increase sales. Field representatives must be sufficiently aware of the complex problems of modern production agriculture to be able to evaluate the place of given inputs in each farm operation.

The long-run economic health of both the farmer and the suppliers of chemicals is at stake.

[2] U. S. Department of Agriculture, Agricultural Research Service, Bulletin No. 202.

Fortunately, nearly every industry serving agriculture today is aware of these responsibilities. However, success in meeting them has not been uniform. Most concerns have attempted to recruit personnel with technical agricultural training and experience to serve as their field representatives.

Certainly this approach is the most appropriate. Yet, there is undoubtedly room for improvement in at least two ways:

The training of college students in agriculture has often been too narrowly oriented for them to meet the immediate demands of a farm representative position in a commercial concern. Few would question the competence of today's agricultural graduate in the physical and biological sciences.

But, the nature of the responsibilities of the positions require more than these disciplines. Understanding of the business management aspects of farms, the basic economic structure within which the farmer operates, and the institutional environment surrounding today's farm operation are essential to sound recommendation for the use of modern technology in agriculture.

Fortunately, agricultural colleges are beginning to offer the kind of training required, though far too few students are being graduated to meet the growing demand for young men and women with the combination of technical and business training in agriculture.

Agricultural industries can do much to solve their future personnel problems by encouraging competent young people to train for the agricultural service industries.

WHAT'S AHEAD?

Agriculture in the United States is undergoing fundamental changes. Farms are getting larger in all geographic locations; emphasis is continuing to shift, but at a more rapid rate, toward the business-side of farming; and greater emphasis is being placed on adjustment of our agriculture to other segments of the economy. Perhaps relatively less is being said today about internal efficiency in our farms but progress continues to be made in increasing the productivity of the basic agricultural resources.

Chemicals are and will continue to play a major role in these adjustments. If the experiences gained in the profitable use of chemicals in the more intensively farmed areas can be projected, it is certain that the use of chemicals will increase substantially as the agriculture of the nation intensifies.

For example, as irrigation becomes more widespread more farmers will have better control over moisture conditions and thus heavier rates of fertilizer applications will become feasible. Intensified cropping systems will necessitate additional use of chemicals.

Some speculate that in the future, chemicals may assume a dominant role in agriculture as the land base becomes smaller and population increases. Whether one subscribes to this viewpoint or not, farm chemicals will likely be a dominant force in determining changes in the productivity of agriculture per unit of land area in the years ahead. Newer products such as growth regulators together with further use of the more established chemicals will contribute substantially to the prosperity of American farmers and to the well-being of consumers, both here and abroad. ▲

The Montana Congressman (seated behind the desk), who introduced a bill to increase pesticide research appropriations from $280,000 to over $2.5 million, gives the author his views of

PESTICIDES and WILDLIFE

By PETER C. CROLIUS

Interview with Democratic Congressman Lee Metcalf of the First District of (western) Montana. This is the legislator's fourth term in Congress, and he has been intensely interested in conservation and preservation of natural resources. He is a member of the House Ways and Means Committee. He has sponsored several conservation measures, and in this regard is frequently linked with conservation-minded Senator Warren Magnuson of Washington. The opinions expressed below by Congressman Metcalf are his own and not necessarily those of this publication.

Q. *Congressman, in several instances you have used the words "dumping," "scattering," and "dousing" in connection with the application of pesticides. Am I to infer that you are against the use of pesticides?*

A. No. I'm not against the use of pesticides, but I am against the use of these chemicals without full knowledge of what they do . . . both the short and long term results and their effects on citizens and wildlife. If I were against their use, I would introduce a bill prohibiting their use.

Q. *When S. 2447 was up for consideration last year, you stated before a Senate Committee that "dead fish, pheasant, quail, ducks . . . are a poor trade for dead bugs." Don't you think that when bugs threaten an agriculturally important crop or product that the trade is a sound one even though damage to fish and wildlife does result?*

A. Sometimes yes. But frequently the trade is not a good one. For instance, when the Yellowstone area was sprayed against the spruce budworm, the recreational income loss was greater than the benefits derived. If the only way to save the crop or product is to spray, then we must. But I think we should aim to save the forests and the fish and wildlife and the crops.

Q. *You have also stated that "we must be concerned over the potentially destructive effects of these chemicals on wildlife." Why must we?*

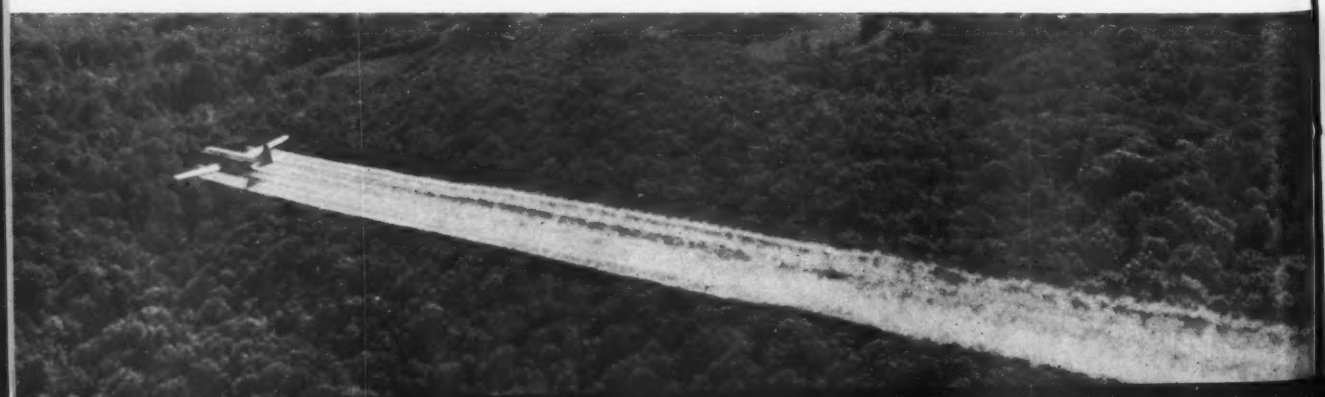
A. In many areas—particularly in Montana and other refuges of wildlife in the West—quail and pheasant and waterfowl and small game are a very important part of the economy for hunting and fishing. Killing these animals destroys the spiritual and historical heritage of the land by upsetting the balance of nature.

Q. *Have you received definite proof that pesticides are responsible for damaging wildlife populations?*

A. No. In fact, no one can definitely say what they do. That's why I've backed and introduced bills to find out. Who knows whether it's the solvent, the carrier, or the chemical that's the killer. Maybe it's a combination. Perhaps only high dosages kill. Perhaps when a "perfect kill" is accomplished insect-eating animals die of hunger. But we must *know* these answers before we indiscriminately spread chemicals.

Q. *Do you think that pesticide manufacturers are totally unconcerned with the wildlife problem?*

(Continued on page 47)



When the Pacific Northwest Plant Food Assn. met in Tacoma last month, delegates heard technical papers and discussions of

THE DEALER'S MARKETING DUTIES

THE TENTH annual fertilizer conference of the Pacific Northwest Plant Food Association was held in Tacoma, Washington, July 7–9, with an attendance of over 200.

Principal subjects of most of the papers presented dealt with technical aspects, with much emphasis on the retailer's marketing duties. Among the latter was the talk presented by Moyle S. Williams, of the National Plant Food Institute.

He told the delegates that the basic reason farmers use fertilizers is economic—a fact often forgotten by the fertilizer salesman. He stated that much of the information given to farmers about the use of fertilizer is not being presented in terms of economic benefits, even though it has been proven over and over again that crops can be produced at lower costs with fertilizer than without.

Getting the farmers started to using fertilizer is the most difficult task, but speaking in terms of material gains, it can be done. And once the soil becomes a better producer, the potential of fertilizer use increases.

Williams also pointed out that dealers have a golden opportunity to tell the fertilizer story to others beside farmers, by talking to service clubs and civic groups, showing by the use of slides just how economic gains are made by farmers who use fertilizers. They, in turn, can help to educate the farmer to such use.

'FERTILE OPPORTUNITIES'

C. B. Harston, Agricultural Extension Service, Pullman, Washington, presented what was undoubtedly one of the most colorful subjects of the entire convention. Speaking on "Washington's Fertile Opportunities in Soil Fertility," he showed how the diversity of conditions in Washington provides opportunities which are almost unlimited.

"The agronomist is called on to make fertilizer recommendations all the way from lavender to Douglas fir. The fertilizer dealer is called on to supply the right material for these and more. The extreme variety of soils and conditions in the state call for a better understanding of *local* soil needs which include nitrogen, phosphorus, potassium, and a growing list of other essential items. Areas of boron deficiency are widespread. Insufficient sulfur reduces eastern Washington yields of alfalfa, clover and even wheat.

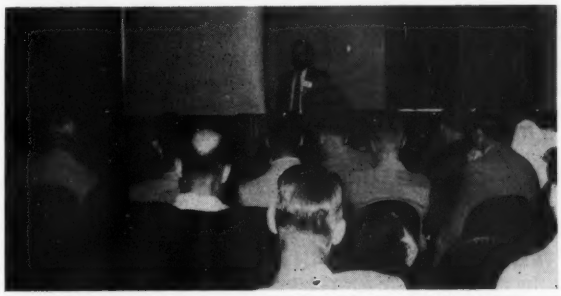
"The newest addition to recognized fertility needs is molybdenum, with the largest known deficiency in eastern Washington. Other deficiencies still remain to be identified," he said.

Harston went on to point out that the problems go beyond the amount and kind of fertilizer applied, including farming practices, placement of fertilizer, irrigation, drainage, erosion and weed control, all directly influencing the effectiveness of the fertilizer. He made it clearly apparent that the dealer who would be successful has to have an almost unlimited knowledge of these problems if he is to be of assistance to the farmer.

W. P. Mortenson, from the Western Washington Experiment Station in Pullman, pointed out in his paper that while generally good net returns from use of fertilizer are being obtained, many farmers are not realizing the fullest value from such use for many reasons, most of which could be corrected by the dealer:

1) Application of fertilizer at an improper rate,

F. Todd Tremblay, National Plant Food Institute



Fred Koehler, Agronomy Dept., State College of Washington

Aaron Baker, Western Washington Experiment Station

H. B. Cheney, Soils Dept., Oregon State College

2) Use of fertilizer that is of an improper ratio or kind for the crop,
3) Application by an inefficient method,
4) Application at the wrong time.

Mortenson said that dealers who help farmers to eliminate these problems could expect a definite increase in the use of fertilizers by their customers.

A subject which many dealers in farm chemicals have overlooked in recent years is the increasing growth of the home-fertilizer industry, although there are examples where some farm chemicals dealers, squeezed between high production costs and low profits, have converted entirely to this field.

TURF FERTILIZATION POTENTIAL

Roy L. Goss, also from WWES at Pullman, pointed out in his speech that many people believe that turf is the No. 1 crop from the standpoint of its annual cost and number of people engaged in the industry. He pointed out that there are over 850,000 homes in the state of Washington alone with more than 55,000 acres of grass in lawns estimated at a cost of installation of over $161 million. The annual fertilization cost on lawns alone runs to over $4 million. He declared that very few of these actually receive adequate fertilization, and even saying that perhaps 10% of fertilizer production is being used in this field, how much more would be used if the turfgrass nutrition were raised to its optimum level?

The importance of correct soil sampling was stressed by A. R. Halvorsen, Department of Agronomy, State College of Washington, Pullman. He pointed out that if the soil sample incorrectly represents the area to be fertilized, the recommendation would obviously be incorrect. He stated, however, that obtaining a representative soil sample was not especially difficult, and that by following recommended sampling procedures most errors could be eliminated.

There were a host of other speakers on the tightly scheduled program, most of them dealing with technical aspects of fertilizer programs followed in definite areas in Washington, Oregon and Idaho. Special emphasis was placed on timber and garden crops.

TREMENDOUS GROWTH AHEAD

Out of the convention came one pervading thought, and it was apparent in the approach of almost every speaker and in the conversation of the delegates—and that was that the fertilizer dealers have just barely scratched the surface of the actual potential in the Pacific Northwest for their product. Tremendous growth is apparent in the future, and the dealer who keeps abreast of the constant changes in plant food nutrition is going to be the one who grows along with the industry, with those who ignore the continual shifts brought about by increased knowledge "missing the boat."

The technical papers presented at the last session of the conference generated a good deal of "question-and-answer" periods, with opposite camps in some questions presenting their opinions forcefully and honestly.

Delegates felt, at the convention's end, that it was undoubtedly the best convention to date, and departed for their various areas with renewed interest in their business, and an increased knowledge which will allow them to give better service to their customers. ▲

MATERIALS HANDLING
CUSTOM APPLICATION

Determining the DRILLABILITY of Fertilizers

A summary of tests conducted in 1958 by USDA agricultural engineers with fourteen plant foods—five nitric phosphates, a prilled ammonium nitrate and eight mixed fertilizers. The researchers were Charles W. Gantt, Walter C. Hulburt, Herbert F. Rapp and John O. Hardesty, Beltsville, Md.

Table 1. Analysis of Fertilizers

Sample numbers	Nominal grade	Chemical analysis: Total N Per cent	Total P_2O_5 Per cent	Available P_2O_5 Per cent	K_2O Per cent
1	5–20–20	5.2	22.3	22.0	17.2
2	[1]6– 8– 4	6.0	9.2	8.3	4.7
3	[1]6– 9–12	6.0	9.9	9.6	10.7
4	[2]8–12–12	7.8	11.6	11.4	12.1
5	8–16–16	8.1	17.3	16.9	15.2
6	8–24– 0	8.2	25.0	24.7	—
7	[3]11–11–11	11.5	11.9	11.4	11.1
8	[4]11–22–11	11.4	23.6	23.1	11.8
9	[5]12–12–12	12.0	12.4	12.4	12.9
10	12–12–12	11.9	13.2	12.9	11.8
11	[3]14–11–11	14.1	11.7	11.3	11.6
12	15–10–10	15.0	11.0	10.8	9.9
13	[3]17–22– 0	16.9	23.2	22.4	—
14	[6]33– 0– 0	33.5	—	—	—

[1]Commercial nongranular mixture. [2]Commercial granular mixture. [3]Experimental granular nitric phosphate prepared by the Tennessee Valley Authority. [4]Experimental granular high-alumina nitric phosphate prepared by the Tennessee Valley Authority. [5]Commercial granular nitric phosphate. [6]Commercial prilled ammonium nitrate.

Of the fertilizers listed, five were commercially manufactured, while nine were experimental mixtures prepared by U. S. government agencies.

HOW UNIFORMLY are most fertilizers applied to the field by a fertilizer drill? For the answer to this important question USDA engineers of the agricultural engineering laboratory, ARS, Beltsville, conducted tests in 1958. Here was their general conclusion:

Drilling characteristics of most fertilizers lie somewhere between those of prilled ammonium nitrate and the 11-22-11 high alumina nitric phosphate. (see table 2). These findings were substantiated by previous studies using the same equipment.

Any fertilizer possessing drilling properties superior to those of prilled ammonium nitrate may be considered drillable under normal conditions of application in the field. All the materials described in the table were found to be superior to prilled ammonium nitrate in drillability, and most were far superior. Any material that approaches the 11-22-11 high alumina nitric phosphate in drilling properties may be considered excellent.

Drillability of a fertilizer may be defined as a measure of the uniformity with which its plant nutrients can be applied to the field by a fertilizer drill. This implies that perfect drillability represents a uniformity of flow through the fertilizer drill that will result in an equivalent amount of nutrients being supplied to all crop plants in the fertilized area. Such uniform application is of utmost importance in securing maximum benefits from the fertilizer. Drillability is influenced by such properties of the fertilizer as size and shape of the particle, segregation of particles, caking tendency, apparent specific gravity and hydroscopicity.

However, a factor to consider in evaluating the ultimate drillability of a fertilizer is the effect of soil absorption on its distribution during the drilling operation. When a hygroscopic fertilizer is exposed to high humidity during the drilling operation, the rate of application may change and the flow may become irregular ▲

Above, a freshly opened bag is screened after a drop test to determine percentage of lumps.

Bags of fertilizer are stored under three bags of sand in an air control room at Beltsville, Md.

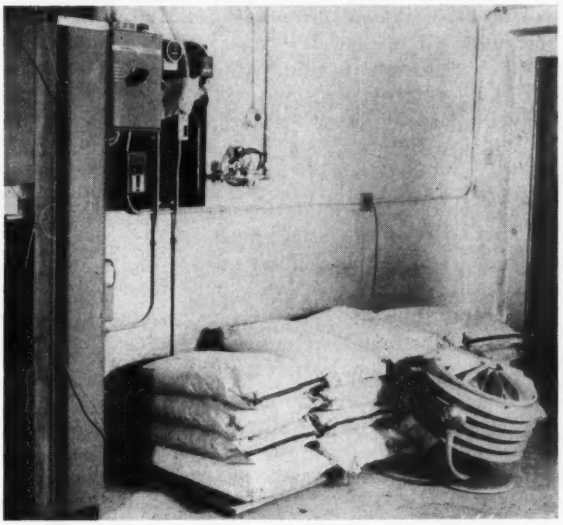


Table 2. Effect of Exposure on Relative Drilling Rates, Coefficients of Variation, and Moisture Content of Different Fertilizers

Sample number	Nominal grade	Initial moisture,[1] dry basis	Relative drilling rate and coefficient of variation: Hours of exposure 0		1		2		3		4		5		Length of time material remained drillable	Range of moisture content, dry basis, within which material became undrillable
			Rate	Coefficient	Rate	Coefficient	Rate	Coefficient	Rate	Coefficient	Rate	Coefficient	Rate	Coefficient		
		Percent	Percent		Percent		Percent		Percent		Percent		Percent		Hours	Per cent
1	5-20-20	3.8	100	7.7	99	6.6	99	5.2	[3]	—	—	—	—	—	2	8.8–11.5
2	6- 8- 4	2.9	100	7.4	97	8.3	52**	12.4	[3]	—	—	—	—	—	2	7.0- 8.8
3	6- 9-12	1.7	100	10.4	88**	6.2	53**	14.4	[3]	—	—	—	—	—	2	6.7- 8.4
4	8-12-12	1.0	100	8.2	90**	5.7	60**	9.0	[3]	—	—	—	—	—	2	5.1- 7.5
5	8-16-16	1.9	100	10.3	101	10.0	81**	11.1	[3]	—	—	—	—	—	2	7.3- 9.9
6	8-24- 0	3.7	100	7.1	97	6.5	91**	6.9	81**	4.8	65**	6.0	[3]	—	4	12.2–13.8
7	11-11-11	1.3	100	11.3	92**	10.7	65**	12.1	[3]	—	—	—	—	—	2	7.1- 9.9
8	11-22-11	2.0	100	9.7	99	8.3	98	10.7	99	11.0	102	10.8	101	8.4	>5	[3]16.2
9	12-12-12	1.5	100	6.4	88**	7.9	[3]	—	—	—	—	—	—	—	1	4.8- 7.9
10	12-12-12	1.3	100	10.9	89**	7.7	[3]	—	—	—	—	—	—	—	1	4.4- 7.7
11	14-11-11	3.2	100	13.7	[3]	—	—	—	—	—	—	—	—	—	<1	3.2- 8.0
12	15-10-10	.6	100	13.2	99	10.7	[3]	—	—	—	—	—	—	—	1	3.4- 6.3
13	17-22- 0	.8	100	12.9	57**	15.2	[3]	—	—	—	—	—	—	—	1	4.6- 8.5
14	33- 0- 0	.2	100	9.0	[4]	—	—	—	—	—	—	—	—	—	1/8	1.5

[1]Moistures determined by vacuum-desiccation method approved by the Association of Official Agricultural Chemists. [2]Failed to drill. [3]Moisture content after 5 hours of exposure. [4]Failed, became undrillable after 20 minutes of exposure on trays. **Significantly different at 1-per cent level.

NEWS OF THE INDUSTRY

V-C BREAKS GROUND FOR INDIANA FERTILIZER PLANT

On July 7, Virginia-Carolina Chemical Corp. broke ground in Jasonville, Ind., for a new, ultra-modern fertilizer plant that will serve farmers in southwestern Indiana and parts of southeastern Illinois.

The T-shaped structure will be in operation by January 1, V-C said. In peak seasons, 35 workers will be employed in addition to an office and sales force.

The timber frame structure will be 390 feet long and 105 feet wide at the top of the "T" and 120 x 90 feet at the tail. It will have 51,750 square feet of floor area.

Sales manager for the new plant will be G. F. Flenniken, who has been with V-C for nearly 12 years. Plant superintendent will be Mack Tune, who started with the company in 1953 at the Wilmington, N.C. plant.

IMC CELEBRATES ITS HALF CENTURY

International Minerals & Chemical Corp. celebrated its 50th anniversary on June 14. A traveling display of historical pictures and adoption of a special anniversary emblem are features of the celebration program which will continue throughout the year.

The display, to be circulated to various IMC plant locations, recalls mining methods of 1909, along with other memorabilia of the times—fashions, songs and heroes, including Admiral Peary, for example, who discovered the North Pole on April 6 of that year.

NINTH PLANT FOR VICTOR CHEMICAL

Construction, on a waterway site in Chicago, Ill., of Victor Chemical Works ninth manufacturing plant is expected to begin shortly. It is reported that the first unit, to be completed in time for 1960 demand for liquid plant foods, will be a phosphoric acid plant.

CENCO INSTRUMENTS ACQUIRES SOILTEST

Cenco Instruments Corp. has announced acquisition of Soiltest, Inc. from Theodore W. Van Zelst for 18,000 shares of Cenco common stock and an undisclosed amount of cash.

John T. Gossett, Cenco chairman, said Soiltest will be operated as a Cenco subsidiary, with no changes in management. Soiltest's testing apparatus is used in agriculture, the construction field, industry, schools, research laboratories and by government agencies.

NEW SULFURIC ACID PLANT TO BE BUILT IN UTAH

Dixon Western Chemicals, Inc. plans to build a 500-ton-a-day sulfuric acid plant at Sulphurdale, Utah, according to a report by J. E. Jarrard in the Deseret News Salt Lake Telegram.

Dixon Western is reported to be a newly formed company of American Sulphur & Refining Co. and Dixon Chemical & Research, Inc.

At right, the modern dragline of today scoops up a carload of ore at a time. High pressure water system washes the mineral and floats it to the processing plant.

This was phosphate mining in the Florida fields when IMC was founded 50 years ago. Industry production that year was 2,330,000 tons, compared with an estimated 14½ million tons in '58.

OLIN MATHIESON UPS TELEVISION ADVERTISING

The Chemicals Div. of Olin Mathieson Chemical Corp. will increase its national television advertising in 1959–60 through the firm's first full-time sponsorship of Edward R. Murrow's award-winning program, "Small World." The program will be carried by about 135 stations on the CBS network for 33 consecutive Sundays beginning Oct. 4.

While Murrow will be on a sabbatical from his regular CBS duties, he will moderate most of the 1959–60 "Small World" programs by originating them from the various countries he will visit.

ELI LILLY & COMPANY DEDICATES RESEARCH CENTER

Special plant growth rooms permit Lilly scientists to conduct plant studies year-round. In mid-winter, an astronomical clock can be set to simulate light, temperature and humidity conditions found in Central Indiana in late summer, Lilly reports.

On June 16, Eli Lilly & Co. unveiled its $5 million research center for agricultural sciences, at Greenfield, Ind.

The 500-acre center includes fifteen new buildings and several previously existing ones. Here, Lilly scientists conduct studies in animal nutrition, and animal and plant disease and pest control for both farm and home.

The facilities include an administration building, power plant, veterinary laboratories building, incinerator, veterinary barn and plant sciences laboratories building with three adjoining greenhouses. There are insect-rearing rooms where pests ranging from minute mites to 3-inch roaches are grown for insecticide testing.

HOOKER CHEMICAL'S SALES & EARNINGS IMPROVE

Sales of Hooker Chemical Corp. increased 24 per cent while earnings increased 34 per cent after taxes for the first six months of the company's fiscal year ended May 31, 1959, compared with the like period of 1958. For the second quarter, the company showed a sales increase of 28 per cent and an earnings improvement of 42 per cent over the second quarter of 1958.

Net sales for the 1959 six months period were $74,732,200 compared with $60,155,200 for the like 1958 period, and earnings of 93 cents per share of common stock compare with 69 cents in the 1958 period after income taxes.

Company officials commented that the improvement which started last August has continued, in all phases of the business.

Hooker announced that a new unit for production of phosphates from ferrophosphorus and a new phosphoric acid plant at Jeffersonville, Ind., were recently authorized.

TWO CELEBRATIONS IN PLANT CITY, FLA.

This year, Plant City, Fla., is celebrating two anniversaries. One is its own, the 75th, and one belongs to Coronet Phosphate Div. of Smith-Douglass, its 50th year.

TESTS WITH MERCK'S NEW MICROBIAL INSECTICIDE

A new microbial insecticide—Agritrol—is proving its effectiveness in tests underway to control looper on shade-grown tobacco, according to Dr. J. M. Merritt, manager, plant product development, Merck & Co., Inc., Chemical Div.

Agritrol is a formulation of a microbial pathogen, Bacillus thuringiensis. These bacilli produce spores and at the same time produce "crystals" which are toxic to the larvae of surface feeding, chewing insects. These include such major farm and forage pests as bollworm, budworm, hornworm, corn borer, corn earworm and gypsy moth.

Other experiments are being conducted during the 1959 season at experiment stations throughout the country, Dr. Merritt reported.

Associations Meetings

Chuck Painter and F. Todd Tremblay

SURVEY ALFALFA FIELDS FOR NUTRIENT DEFICIENCIES

Chuck Painter (left) soils extension specialist, and F. Todd Tremblay, regional director of the National Plant Food Institute, inspect an excellent field of alfalfa in Idaho on their soil-analysis plant-analysis survey which was recently completed. NPFI cooperated with the Idaho Extension Service in making the survey. About 120 samples were taken just prior to the first cutting of alfalfa.

Farmers whose fields were sampled will be advised of the nutrient status of their fields after analyses are completed, and recommendations will be made.

KENTUCKY FERTILIZER CONFERENCE HELD JULY 29

Program for the annual fertilizer conference held at the University of Kentucky on July 29, featured grass and forage crops.

The movie "Cash In On Grass" produced by the National Plant Food Institute, opened the morning meeting, followed by comments from T. H. Taylor, crops agronomist, on pasture management, and E. C. Doll, soils agronomist, on research results in pasture fertilization. Warren Thompson, extension pasture specialist, discussed the pasture extension program.

"Business Can Be Fun" was the topic of Penrose T. Ecton, Lexington business man and conference luncheon speaker.

Zenas Beers, midwest regional director of NPFI, opened the afternoon program with an explanation of the Institute program for the midwest area and how it is expected to affect agricultural pro-

Calendar

Aug. 3-7. Gordon Research Conference on Biochemistry and Agriculture, Kimball Union Academy, Meridian, N. H.

Aug. 12-13. Northeast Fertilizer Safety School, Cornell University, Ithaca, N. Y.

Aug. 18-19. Midwest Fertilizer Safety School, National Safety Council Headquarters, Chicago, Ill.

Aug. 18-19. Alabama Fertilizer Conference, Alabama Polytechnic Institute, Auburn.

Aug. 18-22. Canadian Fertilizer Assn. Annual Convention, Bigwin Inn, Lake of Bays, Ontario.

Aug. 26-28. Soil Conservation Society of America 14th Annual Meeting, Rapid City, S. D.

Aug. 28-29. Southeast Fertilizer Safety School, Heart of Atlanta Motel, Atlanta, Ga.

Aug. 28-29. Minnesota Agricultural Ammonia Institute, University of Minnesota, St. Paul, Minn.

Sept. 20-23. Canadian Agricultural Chemicals Assn. 7th Annual Meeting, Chateau Frontenac, Quebec City, Que.

Sept. 24-25. Annual Northeastern Fertilizer Conference, NPFI, Biltmore Hotel, New York City.

Sept. 30-Oct. 1. Fourth Southeastern Fertilizer Conference, Atlanta Biltmore Hotel, Atlanta, Ga.

Oct. 13-14. Western Agricultural Chemicals Assn. Fall Meeting, Villa Hotel, San Mateo, Calif.

Oct. 14-16. Pacific Northwest Plant Food Assn. Annual Convention, Chinook Hotel, Yakima, Wash.

Oct. 21-23. National Agricultural Chemicals Assn. 26th Annual Meeting, French Lick-Sheraton Hotel, French Lick, Ind.

Nov. 4-6. Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 5-6. Far West Fertilizer Safety Training School, Fresno, Calif.

Nov. 8-10. National Fertilizer Solutions Assn. Annual Convention, Statler Hilton Hotel, St. Louis, Mo.

Nov. 9-11. California Fertilizer Assn. Annual Convention, Fairmount Hotel, San Francisco, Calif.

Nov. 12-13. Southwest Fertilizer Safety Training School, Houston, Tex.

Nov. 16-20. National Aviation Trades Assn. Annual Convention, New Orleans, La.

Dec. 7-10. North Central Weed Control Conference, Royal Alexandra Hotel, Winnipeg, Manitoba.

Jan. 6-8. Fourteenth Annual Northeastern Weed Control Conference, Hotel New Yorker, New York City.

duction in Kentucky. G. W. Schneider, head of the department of horticulture, outlined some of the problems encountered in fertilizing horticultural crops. The program was concluded with a discussion of the fertilizer grade list for 1960, by H. F. Miller, extension specialist.

PLANS ANNOUNCED FOR REGIONAL SAFETY SCHOOLS

"Due to the outstanding success of the Safety Training Schools on the first try last year, plans are being made for expanded attendance and participation of fertilizer industry personnel this year," reports S. M. McCargo, of the Fertilizer Div., National Safety Council.

Five regional training schools will be held, sponsored jointly by NSC's Fertilizer Section and the National Plant Food Institute. The national program will be directed by William C. Creel, chairman of the supervisory training committee of NSC's Fertilizer Section and safety director for the North Carolina Department of Labor.

The *Northeastern* school will be held in Ithaca, N.Y., Aug. 12–13, on the Cornell University Campus, with the New York State School of Industrial and Labor Relations acting as co-sponsor. McCargo, who is personnel supervisor for G.L.F. Soil Building Service, will direct the school. George F. Dietz, safety director for Fertilizer Manufacturing Cooperative, will serve as associate director.

The *Midwestern* School will be held in Chicago, Ill., on Aug. 18–19, in the conference rooms of the National Safety Council's headquarters under the direction of John E. Smith of Pittsburg, Kansas, safety director for Spencer Chemical Co. Associate director will be Roger Hugg, personnel supervisor for International Minerals and Chemical Corp.

A school for the *Southeastern* states will be held in Atlanta, Ga., on Aug. 27–28, at the Heart of Atlanta Motel. Director: Quentin S. Lee, director, plant food production, Cotton Producers Association. Associate director: W. A. Stone, plant manager, Wilson & Toomer Fertilizer Co.

A. I. Raney, safety director for Phillips Chemical Co., will direct the *Southwestern* school at Houston, Tex., Nov. 12–13. Associate director will be Horace Kelly, Olin Mathieson Chemical Corp. safety director.

And on Nov. 5–6, the training school for the *Far West* will be held in Fresno, Calif., under the direction of O. J. Chinnock, technical representative of Hercules Powder Co. Assistant director will be Austin R. Cline, engineer with the Ammonia Div. of Shell Chemical Corp.

A $20 registration fee covers costs of instruction, textbooks, notebooks, other material and two luncheons. Checks should be made out to the National Plant Food Institute, located at 1700 K St., N.W., Washington 6, D.C.

NPFI Officers, Award-Winners

During the Institute's fourth annual convention at The Greenbrier, Eugene Butler (left), editor-in-chief of The Progressive Farmer, and Bob Christianson (left in the photo above), editor of The Arkansas Farmer, were presented awards for "superior journalistic contributions toward the building of the soils of our nation" by the Institute. Dr. Russell Coleman presented the awards to Butler and Christianson, winners in the Institute's nationwide "Soil Builders Award for Editors" contest in a field of 29 magazine entries.

Officers of the National Plant Food Institute, elected by the board of directors on June 17, are (left to right) J. D. Stewart, Jr., president; Richard E. Bennett, chairman of the board; Dr. Russell Coleman, and Paul T. Truitt, executive vice president.

CFA ANNOUNCES AWARD WINNERS IN ESSAY CONTEST

Mike Colt, a student of vocational agriculture at Modesto Junior College, was chosen as winner of the Grand Award in the 1959 California Fertilizer Essay Contest, the California Fertilizer Association has announced. CFA's Soil Improvement Committee is sponsor of this annual event, and its check for $100 was presented to Colt in June by Sidney H. Bierly, general manager of the association.

SAFETY SLOGAN CONTEST

A safety slogan contest has been announced by the Agricultural Aircraft Association, Inc., with a grand prize of a free weekend for two in Las Vegas.

To be eligible, contestants must be residents of California, and connected or associated with the agricultural aircraft industry.

Dates of the contest are July 1 to Sept. 1, 1959. For details, write Agricultural Aircraft Association, Chandler Field, Fresno, Calif.

People

Amchem Products, Inc. Cecil H. Meadors, formerly with Spur Agricultural Experiment Station, has joined Amchem as a sales development specialist on brush killers for range lands and on special types of weed killers for farms.

American Agricultural Chemical Co. A. F. Vetter, former production superintendent at the Washington C.H., Ohio, plant, has been named division maintenance superintendent for the company's Northeastern Div. A. W. Powell replaces Vetter at Washington C.H., and J. F. Watkins succeeds Powell as Alexandria, Va., superintendent.

B. E. Thorne has been named Agrico sales manager for New England. He will continue to be located at North Weymouth, Mass., where he has been assistant manager since 1955. He replaces J. J. Graham, who recently transferred to the company's general credit office in New York.

Thorne

American Cyanamid Co. Dr. E. L. R. Stokstad, the first scientist to establish the growth-promoting effect of antibiotics on animals, has been appointed director of research for Cyanamid's Agricultural Div., according to Frank S. Washburn, division general manager.

Newly named assistant to the manager of the Process Chemicals Dept. is Charles H. Groezinger, Jr.

University of California. Dr. Charles A. Fleschner succeeded Curtis P. Clausen on July 1 as chairman of the Berkeley-Riverside department of biological control. Now searching for beneficial insects in the Orient, Dr. Fleschner will assume his duties on returning to Riverside in August.

Collier Carbon and Chemical Corp. has reassigned three members of its marketing department: R. H. McGough has been appointed manager of chemical sales development; J. G. Baldwin, manager of chemical sales; and William R. Van Liere, manager of agricultural chemical sales.

Diamond Alkali Co. Promotion of Robert K. Buettner, supervisor of the Tax Dept., to assistant controller of the company has been announced by W. A. Crichley, controller.

Ferguson Fumigants, Inc. Election of Ray P. Millard as vice president and assistant general manager has been announced by J. Carl Dawson, president. Millard had been executive director of J. Carl Dawson & Associates, preventive sanitation consultants.

Millard

Gallowhur Chemical Corp. Henry Gould, who joined the company last year as chief chemist, has been named technical director of Gallowhur.

Grace Chemical Div., W. R. Grace & Co. Dr. Robert Q. Parks has been promoted to general manager, reports President William J. Haude. Frank J. Ronan succeeds Dr. Parks as general sales manager. Parks joined Grace in 1953 as manager of agricultural services, and became general sales manager in 1955. Ronan was formerly midwestern district sales manager for Grace Chemical Div.

Parks

Ronan

International Minerals & Chemical Corp. Everett C. Horne has been named sales manager of the Basic Materials Dept., reporting to Leonard W. Gopp, vice president in charge of sales for the Agricultural Chemicals Div.

Horne

The company's sales staff, which will handle a full line of IMC fertilizer ingredients, consists of five regional managers under Horne, supported by 12 district managers. Regional managers are Fred C. Broadway, Atlanta; George J. Urbanis, Indianapolis; Gerd W. Kraemer, Minneapolis; Jack K. Lindsey, Shreveport; and William W. Chadwick, New York.

Merck & Co., Inc., Chemical Div. William E. Guenther has been appointed assistant to the operations and training manager in agricultural sales. Guenther went to Merck in 1949, and has been sales representative in Birmingham, Ala., since 1956.

Dale C. Dean has been named agricultural sales representative for Alabama, Mississippi, Louisiana and northwestern Florida customers. He will reside in Birmingham, Ala.

Michigan Chemical Corp. Robert M. Hutchison goes to the firm as supervisor of costs. He has been a member of the staff in the Detroit office of Lybrand, Ross Bros. & Montgomery.

Miller Products Co. Roy Miller, president, announces the appointment of two additional sales representatives: Allen Donaldson, who returns to Miller after two

Donaldson

Williams

Fitzgerald

Glass

years absence, takes over small package sales in the Portland and lower Columbia area of Oregon; and Dick Williams, who joins the firm after four years in farm chemicals sales, will represent the company in eastern Washington and northern Idaho.

Monsanto Chemical Co. Arthur P. Kroeger has been appointed assistant general manager of the Organic Chemicals Div. at St. Louis, after serving as the division's director of marketing since 1958. Herbert S. Parham succeeds him as director of marketing. Parham had been director of sales planning.

Naugatuck Chemical Div., U. S. Rubber Co. Dr. Bogislav von Schmeling, a research plant pathologist, becomes a member of the division's agricultural chemical research and development staff. He has been assigned to the biological research group, with fungicides as his research area.

Olin Mathieson Chemical Corp. Plant Food Div. vice president, S. L. Nevins, has been awarded the crested 4-H clover citation for his "outstanding contribution to 4-H Club work in America."

Smith-Douglass Co., Inc. M. W. Mawhinney is named manager of the Streator, Ill. operation; Mack A. Glass succeeds Mawhinney at Albert Lea, Minn.; and R. G. Fitzgerald, who was manager at Streator, has been named manager of contract sales.

Mawhinney

U. S. Industrial Chemicals Co. Warren E. Johnson, Vincent D. McCarthy and George H. Stanton have been named to fill three new sales management positions. Johnson is appointed director of chemical sales; McCarthy, director of plastics sales; and Stanton will assume the position of director of field sales later in the year.

Government

N.C. FERTILIZER LAW AMENDED AS OF JULY 1

An act of the 1959 legislature makes several amendments to the North Carolina Fertilizer Law effective on July 1.

The new measures bring contract application of fertilizers under provisions of the law, remove from grade-list restrictions fertilizers sold in packages of 25 pounds or less, and make compulsory the "reporting system" for payment of inspection fees.

The definition of mixed fertilizers covered by the law was rewritten to read as follows (italicized words were added by the 1959 act):

"The term 'mixed fertilizers' means *products resulting from* the combination, mixture, *or simultaneous application of two or more fertilizer materials for use in or* claimed to have value in promoting plant growth *by a manufacturer or contractor.*"

ICA AUTHORIZATIONS

Korea—Agricultural pesticides—$200,000 (PA 89-236-99-928-9071). Contracting period: June 15 to Nov. 30. Source: World wide. Terminal delivery date: Dec. 31, 1959.

Nitrogenous fertilizers—$4,410,000 (PA 489-230-99-828-9076) and $1,890,000 (PA 489-230-99-828-9077). Contracting period: June 11 to Sept. 30. Source: World wide. Terminal delivery date: Dec. 31, 1959.

Vietnam—Potash fertilizers—$650,000 (PA 30-233-00-Pl-9028)

Phosphates and other fertilizer materials—$660,000 (PA 30-235-99-Pl-9029).

Nitrogenous fertilizers—$2,600,000 (PA 30-230-99-Pl-9030).

Contracting period on three above authorizations: May 4 to Oct. 31, 1959. Source: World wide. Terminal delivery date: Dec. 31, 1959.

Agricultural pesticides—$80,000 (PA 30-236-99-Pl-9032).

Contracting period: May 13 to Oct. 31, 1959. Source: World wide. Terminal delivery date: Dec. 31, 1959.

USDA REPORTS NEW PLANT GROWTH REGULATORS

Three plant-growth regulating compounds that will exude from the roots of treated plants into surrounding soil in quantities sufficient to be reabsorbed by nearby plants have been reported by USDA.

The discovery, arising from basic research on movement of chemicals within plants, gives scientists of USDA's Agricultural Research Service hope of finding similar substances with plant pest control potential.

The recently tested substances—meta-chloro, meta-fluoro, and para-fluoro—are halogenated forms of alpha methoxyphenylacetic acid (MOPA), reported in 1955 by the department as a promising "systemic" with unusual ability to be moved or translocated throughout the plant. Like MOPA, the three chemically-related forms can not only be translocated but can also be exuded from plant roots in their original chemical form.

Another systemic form of MOPA called mandelic acid was found to have no growth-modifying effect. And although mandelic acid cannot be exuded from roots, this indicates to scientists that the characteristic of a compound to be translocated can be independent of any property it may have to modify plant growth. Thus, they report, it may be possible to develop systemic chemicals of many different kinds to serve a variety of purposes.

READER SERVICE

FREE INFORMATION to help you solve fertilizer, pesticide problems

Chemicals

230—COTTON PEST CONTROL LEAFLET

Recommended procedures for control of cotton pests are outlined in a new leaflet from Stauffer Chemical Co. It describes formulations of Trithion available, dosage recommendations and application methods for the control of two spotted mite, cinnabar mite, tropical mite, cotton aphid, leafworm and leaf perforator. Copies are available by

CIRCLING 230 ON SERVICE CARD

231—DOW POLYGLYCOL BULLETIN

The third edition of a bulletin, "Choosing the Right Polyglycol," has just been published by The Dow Chemical Co. and is available to readers. The 24-page bulletin lists for 40 polyglycols the formula, description, average molecular weight, specific gravity, pounds per gallon, refractive index, pour, flash and fire points, approximate solubility, viscosity index and viscosity in centistokes. Descriptive and use information is included for each of these polyglycols, along with method of manufacturing and handling precautions. The booklet may be obtained by

CIRCLING 231 ON SERVICE CARD

232—HANDBOOK FOR FERTILIZER MIXERS

The Spensol Green Handbook, covering all phases of mixed fertilizer manufacture, has been issued by Spencer Chemical Co. The 125-page book is third in a series of Spensol books which the company has published for use by mixed fertilizer manufacturers. Covering both granular and non-granular methods, the book includes formulas for production of all commercial analyses. In addition, basic tables useful in production calculations, plus illustrations of recent innovations in mixed fertilizer manufacturing, are included. For your copy,

CIRCLE 232 ON SERVICE CARD

233—NATIONAL STICKER

A bulletin and sample of National Sticker are available from Hollaway Corp. The product greatly increases the retention qualities of insecticide water spray mixtures, the bulletin reports. The bulletin describes how the sticker was tested, advantages, and test results on apples, peaches, tomatoes, corn, potatoes, cucumbers, dairy barns and cattle.

CIRCLE 233 ON SERVICE CARD

234—FOLDER ON "PLYAC" SPREADER-STICKER

A new folder on Plyac, the polyethylene spreader-sticker produced by Allied Chemical's General Chemical Div., is now available. The product is made from a special form of emulsifiable polyethylene. Plyac, GC reports, is used with pesticide sprays to improve initial residual effectiveness and reduces the number of sprays needed. If you'd like to have a copy, simply

CIRCLE 234 ON SERVICE CARD

235—EMULSIFIER BULLETIN

A description of Witco Emcol emulsifiers H-710, H-712 and H-714 for 2,4-D and 2,4,5-T ester concentrates, along with a listing of typical weed-killer formulations, is presented in a new Emulsol technical bulletin. These emulsifiers are blends of oil soluble amine sulfonates with polyoxyethylene ethers for formulating low foam concentrates. The manufacturer reports that the emulsifiers exhibit marked sludge inhibiting properties in the finished concentrate. For your free copy,

CIRCLE 235 ON SERVICE CARD

236—PENOLA HAN

Penola Oil Co. reports that HAN (heavy aromatic naphtha) improves pesticides because it blends readily with active ingredients, is high in solvency and low in cost. Complete information on HAN is available from the company. Just

CIRCLE 236 ON SERVICE CARD

237—CELITE BROCHURE

Johns-Manville has released a brochure describing the ability of Celite to coat a granule or prill of fertilizer. A diatomaceous silica product, Diatomite is a fluffy, inert powder composed of finely divided particles with high surface area. Particularly important in explaining Celite's efficiency as an anti-caking agent, says J-M, are its loose weight density (less than 10 pounds per cubic ft) and its high liquid absorption (200 per cent). For a copy of the brochure,

CIRCLE 237 ON SERVICE CARD

Process Equipment

238—PVC & BACK PRESSURE VALVES

For corrosion-resistant application, Milton Roy Co. reports development of polyvinyl chloride relief and back pressure valves. They protect positive displacement pumps metering such process liquids as dilute sulfuric acid, hydrofluosilicic acid and hypochlorite solutions from excess pressures. Manufactured in ¼" and ½" sizes, the relief valve can withstand pressures to 400 pounds per square inch at 68 F and 200 psi at 140 F. The back pressure valve is manufactured in the same sizes and can withstand pressures to 200 psi at 140 F. More information is available. Just

CIRCLE 238 ON SERVICE CARD

239—INDUSTRIAL ROTOCYCLE METER BULLETIN

A new two-page, two-color bulletin describing the Type 2S Rotocycle meter is now available from Rockwell Manufacturing Co. The photo-illustrated bulletin also includes specifications and detailed cut-away views of the meter and various registers. Although designed specifically for "lease automatic custody transfer systems" the 2S is also applicable in the chemical, petrochemical and industrial processing fields. For a copy of the bulletin

CIRCLE 239 ON SERVICE CARD

240—CHAIN BELT BULLETIN

A new 72-page bulletin, on belt conveyor idlers and conveyor pulleys, has been published by Chain Belt Co. It carries complete information on Rex rated idlers, including model 1500 idlers with permanently sealed ball bearing rolls for intermediate or moderate loads at moderate speeds. In addition, it contains information on a complete line of welded steel pulleys for belt conveyor, bucket elevator and package-duty service. For your free copy

CIRCLE 240 ON SERVICE CARD

241—CHECKING CHEMICAL SOLUTION STRENGTH

A colorful booklet describing its new method of checking chemical solution strength has been issued by Etna Electronics. Using a submersible electrode and an easily read dial, the solution indicator eliminates checking by titration, test tubes and other hand methods, according to Etna. Two models are available—one for permanent installation and another for interchangeable use. To get the brochure, just

CIRCLE 241 ON SERVICE CARD

how to use the READER SERVICE CARD

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Materials Handling

242—PNEUMATIC COVERED HOPPER

Covered hopper cars that offer both pneumatic and gravity unloading interchangeably have been introduced by the Shippers' Car Line Div. of ACF Industries for rail movement of dry, granular or powdered chemical products. The "Ship-O-Matic" cars, which are for lease or sale to industrial users, are available in one twin-gate size of 2006 cubic feet and three triple-gate sizes of 2927, 3200 and 3500 cubic feet. For details,

CIRCLE 242 ON SERVICE CARD

243—MULTIWALL BAG FEEDER

Development of an automatic open-mouth multiwall bag feeder has been announced by Bemis Bro. Bag Co. It will operate at speeds of 16 bags per minute, and at even higher speeds with some free-flowing products with ample bin supply systems, according to the company. The unit is furnished with a new control system—a switch to activate the cycling operation and individual controls to regulate speed. No special training is required, Bemis reports, to maintain the unit. The Auto-mac automatically feeds bag to bagholder which receives discharge of the product from an overhead scale. As the product is discharged into the bag, Auto-mac delivers the filled bag ready for closing, Bemis says. For literature,

CIRCLE 243 ON SERVICE CARD

244—FIBERGLASS TANK FOR CORROSIVES

A new molded fiber glass tank for use in spraying or storing corrosive liquids is being produced by Molded Fiber Glass Body Co. It is recommended by the manufacturer for use as a spray tank for insecticides and liquid fertilizers, or as a storage tank for chemicals. The tank is easy to clean, lightweight and impact resistant, the firm states. It is 58" long with a 32" diameter. More information is easily obtained. Just

CIRCLE 244 ON SERVICE CARD

245—HANSON FIBERGLASS SPRAYER TANKS

Hanson Equipment Co. now has available a complete line of Fiberglass sprayer tanks ranging in size from 50 to 500 gallons and in a variety of shapes. Impervious to the corrosive action of modern farm chemicals and rust, these sprayer tanks will withstand sharp blows without denting or breaking, Hanson reports. Translucent tank walls allow you to see liquid level at all times with handy sight gauge for reference at either end. Complete information on the line will be yours, if you

CIRCLE 245 ON SERVICE CARD

246—EQUIPMENT SELECTOR CATALOG

A new 16-page catalog describing and illustrating the L-S complete line of materials handling equipment is available free from Lewis Shepard Products, Inc.

See pages 43 and 44 for information on these Reader Service numbers:

256—DirectoJet for Broadcast Spraying
257—Chasetite Bag Closure System
258—Yale & Towne New Electric Truck Line
259—Hough's New Model H-50 Tractor Shovel

The 2-color presentation offers specifications on Rider Fork Lift Trucks, Rider Tractors, Narrow Aisle Rider Electrics, Electric Powered "Walkies" and Manual Equipment. A free copy will be yours, simply by

CIRCLING 246 ON SERVICE CARD

247—NEW BAG FLATTENER

New London Engineering Co. reports its Model BB12EX8′ bag flattener, an 8 foot unit, is designed to flatten bags as they come from filling machines, to assure firm safe stacking or palletizing and storage in the least space possible. The unit is available in belt widths from 8" to 24". Further information is available, by

CIRCLING 247 ON SERVICE CARD

248—PUMP RUNS OFF PICKUP TRUCK BATTERY

After a year's on-the-job testing of more than 300 units, a new model Paddle Pump, direct coupled to an electric motor (6 or 12 volt DC) has been released by the Jerome Simer Co. The 20 gpm noiseless, self-priming, bronze paddle pump is built to fill, empty or transfer liquids like spray solutions, water, gasoline, etc. Simer Co. reports that a variety of accessory items, hoses, nozzles, strainers, etc. are available for adapting the synthetic rubber impellor pumper to individual jobs. To obtain more information

CIRCLE 248 ON SERVICE CARD

Miscellaneous

249—STEAM-JET CLEANER

Less down-time and tie-up of production labor and equipment are required for plant and equipment cleaning with a new 100 gph, portable oil-fired steam-jet cleaner, according to Pantex Manufacturing Corp. Called the Speedysteam 100, the unit is mounted on four rubber-tired wheels. Pantex says that the snap of a switch and opening of only one valve produces adjustable, automatically controlled cleaning pressures from 50 to 150 psi in 90 seconds. Complete details are available, by

CIRCLING 249 ON SERVICE CARD

250—1 YR SUBSCRIPTION TO EQUIPT. MANUAL

Precision Equipment Co. will send interested readers its Equipment Manual for one year. The manual describes and illustrates products for both plant and office, including workbenches, adjustable steel shelving, cabinets, desks, utility and platform trucks and other equipment. For your free 1 year's subscription

CIRCLE 250 ON SERVICE CARD

251—GLASS CATALOG

"Laboratory Glassware," a new 88-page Fischer & Porter catalog, illustrates 377 glass items—ranging from adapters to stopcocks. Prices also are given. You can get a copy, just by

CIRCLING 251 ON SERVICE CARD

252—PLANT GROWTH ROOM

Labline, Inc., manufacturer of the Plant Growth Room, reports "fantastic interest" from agronomists, biochemists, and chemical research and control laboratories in the fertilizer, chemical, pharmaceutical and food fields. Plant Growth Rooms are environmental cabinets that enable scientists to control conditions of temperature, light, humidity and other natural factors pertinent to soil and plant studies. A bulletin with full information is available.

CIRCLE 252 ON SERVICE CARD

253—APPARATUS REVIEW

Forty-eight page LaPine Apparatus Review 10 features the new line of Freas ovens, incubators, sterilizers and special purpose cabinets in a 32-page section. Among the other apparatus listed are cone-drive stirrers, Beckman GC-2 gas chromatographs, moisture determination balances, optical goniometers, disposable polyethylene gloves, closed type fume hoods, atom models. For your copy

CIRCLE 253 ON SERVICE CARD

254—MARKING & SEALING SHIPMENTS

"Marking and Sealing Shipments Made Simple" is the title of a new 24-page booklet offered by Marsh Stencil Machine Co. Among the subjects covered: How to stencil mark goods for safe delivery; proper kind of ink to use; three ways to stencil—brush, roller, spray; conversion tables for weights and measures. For your copy, simply

CIRCLE 254 ON SERVICE CARD

255—SPECTROPHOTOMETERS

Performance and versatility features of the Beckman DK Double-Beam Ratio Recording Spectrophotometers are illustrated in a new brochure published by Beckman Instruments, Inc. The 12-page brochure also lists specifications, application data and accessories for the DK-1 and DK-2 spectrophotometers. For copies,

CIRCLE 255 ON SERVICE CARD

Chemicals

GRUB CONTROL IMPROVES CATTLE WEIGHT GAINS

Results from 40 feed lot tests show that cattle usually put on markedly improved weight gains following effective control of cattle grubs, according to a report released by The Dow Chemical Co.

The report covered 32 tests in which Trolene Boluses were used to control grubs and eight experiments testing application of Trolene in feed.

Of the 32 lots given the bolus treatment, 12 were treated during recommended times. Nine of the 12 showed improved weight gains compared to untreated stock. One group showed no difference in gains and two showed slightly better weight gains among untreated animals, although the gains were said to be too small to be statistically significant.

Of the 20 lots treated after the recommended cut-off date, nine showed improved gains, seven showed no difference, and in four cases untreated stock outgained treated animals.

Amount of weight gain increase also is improved by early treating. Eighteen of the 32 lots of test cattle showed improved weight gains in treated cattle. Nine were treated and averaged .24 pound daily gains. The other nine were treated after Nov. 1 and showed an average of only .14 pound daily gains.

In all of the tests cattle grub control averaged 90 per cent, despite the fact that many of the treatments were made after the recommended period.

USDA ISSUES REPORT ON INSECT-REPELLENT PROPERTIES OF CHEMICALS

Insect-repellent properties of 534 experimental chemical compounds are described in a report issued recently by USDA.

Most of the compounds were synthesized by USDA's Agricultural Research Service and all were tested by the Agricultural Marketing Service for possible use in developing insect-resistant packages.

A free copy of the report, "Laboratory Evaluation of Promising Compounds as Repellents to Flour Beetles, Tribolium Species," Marketing Research Report No. 324, may be obtained from the Office of Information, USDA, Washington 25, D. C.

SOU. POTATO WIREWORM CONTROLLED IN TESTS

Control of the southern potato wireworm, a major insect pest in the early-season potato producing areas of the Southeast, has been experimentally achieved with several organic chemical insecticides, USDA reports.

Diazinon, ethylene dibromide, parathion, Thimet and two experimental materials—AC 18, 133 and SD 4402—gave 82 to 96 per cent reduction of the pests in field plot tests conducted by entomologists of USDA's Agricultural Research Service in cooperation with the South Carolina Agricultural Experiment Station at Charleston.

The insecticides were applied on the plots in late fall and mixed into the upper 4 inches of soil within 1½ hours after application by running a double-disk harrow across the plots. Degree of control was determined by screening samples of soil from each plot 33 days later and determining the mortality of wireworms that had occurred in the samples.

AC 18, 133 gave 96 per cent reduction of the pest. Thimet, parathion, SD 4402 and ethylene dibromide gave 93 per cent control. Diazinon gave 82 per cent control.

Residual effectiveness of the six materials was tested by placing wireworms in cans containing samples of soil taken from plots treated 36 and 83 days earlier. SD 4402 in the 36-day old samples was completely effective against wireworm larvae, and in the 83-day samples was 80 per cent effective. In the 36-day old samples, AC 18, 133 was 89 per cent effective, Diazinon was 56 per cent effective. The other three insecticides failed to control the wireworms over any desired length of time, USDA said.

STAUFFER INTRODUCES FRUIT & VEGETABLE DIP

A fungicidal dip or wash to prevent development of various rots and molds on fruits and vegetables is now being marketed by Stauffer Chemical Co. Called Captan 80 Spray-Dip, the product is a microfine wettable powder containing 80 per cent Captan.

The material is applied as a spray or in wash tanks during normal packing-house operations.

Equipment Supplies

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The wide swath spray required in broadcast spraying may now be controlled and varied to meet wind and field conditions without leaving the tractor, says Spraying Systems Co. Its DirectoJet is designed with a control valve that provides spray to either the left or right side of the tractor, or to both sides at one time as well as on-and-off control. And the entire desired sequence of operations is controlled by the operator without leaving the tractor seat.

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CIRCLING 256 ON SERVICE CARD

CHASE RENAMES ITS BAG CLOSURE SYSTEM

Chase Bag Co.'s new moisture-proof bag closure system has been renamed Chastetite, to more closely identify the process with its originating company, it was announced by R. H. Ayers, vice president in charge of the Paper Bag Div.

Chasetite is a method of closing both ends of multiwall paper bags with a seal that gives positive protection against moisture penetration, Ayers said. The bottom closure is made by Chase when the bag is manufactured. The same type of closure is applied to the top of the bag in the user's own plant by using a Chasetite closure unit which adapts to any existing conveyor or bag filling equipment.

Further information can be obtained by

CIRCLING 257 ON SERVICE CARD

NEW ELECTRIC TRUCK LINE FROM YALE & TOWNE MFG. CO.

Yale Materials Handling Div., The Yale & Towne Mfg. Co., reports development of a compact, end-control electric truck with recycling speed control and high lift speeds.

The new line is being introduced in 2,000 and 3,000 pound capacity models, and will later be expanded to include 1,000 and 1,500 pound capacity trucks.

High maneuverability and the operator's standing position at the rear of the truck on a platform 7 inches from the ground make the trucks ideally suited for truck loading and unloading and general warehouse handling, Y&T claims.

For details,

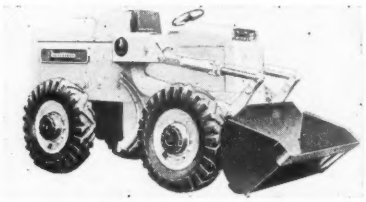
CIRCLE 258 ON SERVICE CARD

HOUGH ANNOUNCES NEW MODEL H-50 TRACTOR SHOVEL

A new four-wheel-drive, rubber-tired tractor shovel with 5,000 lbs. carry capacity, the Model H-50, has been announced by The Frank G. Hough Co. Already in production, this loader will replace the Model HU Payloader.

Features of the new H-50, according to Hough, include more power available for both hydraulics and traction, more efficient torque converter, complete power-shift transmission, power-transfer differentials, power-steering, pry-out bucket action, safety boom arms, power-boosted brakes and numerous refinements. The new gasoline and diesel engines provide from 90 to 92 hp. For literature,

CIRCLE 259 ON SERVICE CARD



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PEST REPORTS

*By Kelvin Dorward**

EUROPEAN CORN BORER ACTIVE IN EASTERN STATES

By the latter part of June ***European corn borer*** populations were very high in both sweet and field corn of all Delaware counties. Fourth and fifth-instar larvae were very common and tunnelling in corn stalks was noticeable. Damage to corn by the borer was very heavy in several fields in Prince Edward county, Virginia. Wheat was damaged in several Virginia counties; Lancaster county had damage to some extent in practically all fields. Populations were heavy in wheat in Talbot, Frederick and Prince Georges counties, Maryland. Field corn infestations ranged up to moderate on the Maryland Eastern Shore but whorl and tassel infestations in sweet corn in Talbot and Queen Annes counties averaged 20–30 per cent. Untreated sweet corn in Cape May county, New Jersey, had European corn borer damage, whereas treated fields were quite clean with only light tassel damage.

European corn borer populations continued light through June in most of the middle western states. Cool weather delayed adult emergence in Ohio and populations were generally low throughout Indiana. Few moths were appearing in Wisconsin by the latter part of June and egg masses averaged 4 per 100 plants in Dane county. Egg masses averaged 4 per 100 plants in Union county, South Dakota, and 8 per 100 plants in Clay county. Peak oviposition in the state was expected early in July. Adult flights were much lighter in Lincoln county, Nebraska, than in 1958. Emergence was 100 per cent complete and egg masses ranged from 2 to over 200 per 100 plants.

Egg mass counts in northwest Missouri ranged from 0–6 per 100 plants. Plants showed feeding damage ranging from 0–65 per cent in the west and central areas of the state. In Riley county, Kansas, up to 75 per cent of the corn plants were infested. Populations of the European corn borer were not sufficiently high in Illinois to warrant control in field corn. In some cases seed and sweet corn required treatment. The heaviest egg mass counts in Illinois, 100 per 100 stalks, were in the northeast with the lowest count being 18 in the eastern part of the state.

In Illinois, however, it was not the European corn borer that was causing the most concern. The insect which had, by the latter part of June, caused the most trouble in the state was the ***black cutworm.*** Although the cutworm outbreak was reported throughout the state, with average losses of infested fields ranging from 15–50 per cent, the most severe damage to late planted corn probably occurred in the southeastern area. Corn in two townships of one county was either completely destroyed or at least the stand was severely reduced.

The ***alfalfa weevil*** is now in Alabama. Larvae of this insect were collected in April from alfalfa in Houston county where extensive damage occurred. First collections of the insect in Tennessee were reported from Johnson and Sullivan counties in late May. Although the insect does not appear to be doing as much damage in the east as in past years, some western states reported serious damage. During the latter part of June the weevil was very heavy in the upper Arkansas Valley of Colorado. The pest is relatively new to that part of Colorado and growers are not aware of the seriousness of the problem. Three years ago the insect was found in a field near Rocky Ford and is now spread generally throughout the valley. In late June alfalfa weevil larvae averaged 10 per sweep in unsprayed alfalfa Crook county, Wyoming, and damage was 30 per cent. Platte county reported some damage but little was reported from other counties checked. One field in Caribou county, Idaho, showed severe damage, while injury was beginning to show in many Bingham and Powers counties fields.

COTTON INSECTS

In general, the ***cotton boll weevil*** was light by late June. Hot, dry weather in the Florence, South Carolina, area curtailed activity. Although squares were punctured generally through the area, untreated fields showed only 13 per cent punctured squares; treated fields, 4 per cent. Hatch in the Mississippi Delta was expected to be light and square infestation was only 2.6 per cent.

Only a few farmers in the Tallulah, Louisiana, area were treating for weevils by the latter part of June and the Arkansas situation was described as looking good, with the number of weevils being low. Infestation counts in the Waco, Texas, area averaged 37 per cent in untreated fields and 8.5 per cent in treated fields. The first evidence of boll weevils in Missouri was from Dunklin county, in late June, where 1.5 per cent punctured squares were reported from 6 fields checked.

Cotton ***bollworms*** were causing little damage in South Carolina by late June and moth catches were lighter than in 1958. Bollworm eggs were increasing in Tennessee. Some damage was reported from the western area but predators were numerous. Moth catches were low in the Mississippi Delta and egg deposition light, as was the case in the Waco, Texas, area. Egg numbers were light in Arkansas and Missouri. Some bollworm damage was reported from Chaves and Eddy counties, New Mexico. The Winterhaven area of Imperial county, California, reported medium infestations of the worm.

During the middle of June ***thrips*** were causing concern in several states. Severe injury from the insect was reported from southeastern Missouri, western Tennessee, delta counties of Mississippi, sections of Oklahoma, Texas and Arizona. ***Spider mites*** were becoming serious in many San Joaquin Valley, California, fields. Severe spotted infestations were also reported from Arizona and North Carolina. ▲

*Chief Staff Officer, Survey & Detection Operations, Plant Pest Control Div., Agricultural Research Service, USDA.

PATENT REVIEWS

By Dr. Melvin Nord

PRODUCTION OF COMBINED FERTILIZER, MULCH AND SOIL CONDITIONER

U. S. 2,881,066, issued April 7, 1959 to Reavis C. Sproull and Clarence D. Cone, Jr. and assigned to Southern Lumber Co., describes a process for producing a combined nitrogenated and phosphorylated fertilizer, mulch, and soil conditioner.

As shown in Fig. 1, an organic wood-like material, such as bark or sawdust, is ground in a grinder *10* to reduce it to small particle size. To provide fertilizer mixtures having different qualities, the wood-like material may be ground to different particle sizes. Storage bins *11* and *12* are provided for receiving the coarse and fine comminuted material, respectively. The comminuted wood-like material thus prepared is transferred to a batch scale *13* and is then conveyed to a rotary digester *14*.

A treating solution containing the desired amounts of urea, phosphoric acid and water is supplied to the rotary digester *14* from a liquor mixing tank *16*.

With the digester *14* charged with the wood-like material and the treating solution, the contents are heated to a temperature of from 80° to 100° C., whereby chemical reaction takes place between the comminuted material and the treating solution. The material thus treated in digesters *14* is preferably washed and then drained of excess liquor by means of a suitable draining tray *17*. Next the treated material is transferred to a drier *18* where it is dried up to a maximum temperature of approximately 110°C.

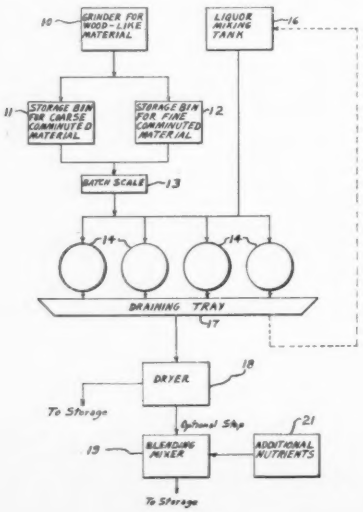

FIGURE 1

To insure complete utilization of the treating solution, the weak solution is recycled from the rotary digester *14* to the liquor mixing tank *16*.

After drying the product in drier *18* it is transferred to storage or for use. If desired, the dried product may be blended with other ingredients or plant nutrients in a blending mixer *19*, the additional nutrients being supplied from a supply tank *21*.

HERBICIDES

U. S. 2,879,150, issued March 24, 1959 to George F. Deebel and Philip C. Hamm, assigned to Monsanto Chemical Co., discloses a method of destroying undesired grasses, utilizing as the herbicidal agents 5-alkyl-2,4,6-trichloropyrimidines.

U. S. 2,880,082, issued March 31, 1959 to Burton V. Toornman and assigned to The Dow Chemical Co., discloses the use as herbicides of 2,2-dichlorobutyric acid and its salts.

U. S. 2,882,140, issued April 14, 1959 to Norman E. Searle, assigned to E. I. du Pont de Nemours & Co., discloses the use as herbicides of certain halogen-containing arylcarbonyl arylcarbamoyl sulfides.

PESTICIDES

U. S. 2,879,199, issued March 24, 1959 to Milton Kosmin and Van R. Gaertner, assigned to Monsanto Chemical Co., discloses the use as a nematocide of certain N-alkyl-N-(tridecylpolyoxyethylene) morpholinium salts.

U. S. 2,882,196, issued April 14, 1959 to Glentworth Lamb and Elton L. Clark, assigned to American Cyanamid Co., discloses the use, as an agricultural insecticidal toxicant, of compositions containing O, O-diethyl S-ethylthiomethyl phosphorodithioate and a trichloromethyl benzenethiosulfonate compound.

U. S. 2,882,197, issued April 14, 1959 to Irving D. Webb, Carleton B. Scott, and John W. Yale, assigned to Collier Carbon and Chemical Corp., discloses the use as fungicides of compositions containing certain sulfurized alkyl thioformals.

FERTILIZERS

U. S. 2,879,133, issued March 24, 1959 to Paul O. Marti, Jr., assigned to Standard Oil Co., discloses an anticaking agent for ammonium nitrate, consisting of H_2S treated iron-ferrocyanide.

U. S. 2,879,151, issued March 24, 1959 to William J. Melville, provides a method of producing liquid organic plant food. The process consists of mixing and fermenting an organic composted material with brewer's dried yeast. The soluble ingredients are then flushed out with water. The liquid contains a large amount of beneficial bacteria as well as the amino acids and a balancing of the natural elements, proteins, vitamins, and carbohydrates.

U. S. 2,879,152, issued March 24, 1959 to Gordon A. Coleman, assigned to Allied Chemical Corp., describes a process for producing fertilizers by the acidulation of phosphate rock followed by ammoniation under certain conditions.

U. S. 2,880,063, issued March 31, 1959 to Abraham Baniel and Ruth Blumberg, assigned to Makhtsavei Israel, describes a process for the preparation of phosphoric acid, in which virtually all the P_2O_5 is recovered as H_3PO_4 by the reaction of the phosphate with aqueous hydrochloric acid.

U. S. 2,882,128, issued April 14, 1959 to Jacques Lafont, assigned to Societe d'Etudes Chimiques pour l'Industrie et l'Agriculture, describes the preparation of potassium sulfate from calcium sul-

fate and potassium chloride in an aqueous ammonia solution.

U. S. 2,882,141, issued April 14, 1959 to James M. O'Donnell and assigned to Nitro-Form Agricultural Chemical Co., discloses an improved solid urea-formaldehyde fertilizer composition reacted with an amino polycarboxylic acid, salt, or chelate. The fertilizer composition thus produced is slow-acting, and contains a slowly available plant growth stimulant (the amino polycarboxylic acid component).

U. S. 2,883,266, issued April 21, 1959 to William A. Hodges, Joseph E. Floyd, and Warren H. Lang, discloses a method of producing a phosphoric acid made by the "wet" process which is relatively free of fluorine impurities.

FUNGICIDE COMPOSITIONS

U. S. 2,882,198, issued April 14, 1959 to Joe R. Willard and John F. Henahan, assigned to Food Machinery & Chemical Corp., discloses the use as insecticides, acaricides, and ovicides, of compounds of the class bis-(S-(dialkoxyphosphinyl)mercapto) methanes and bis (S-(dialkoxyphosphinothioyl)-mercapto)methanes.

U. S. 2,883,318, issued April 21, 1959 to Johannes Bras, assigned to N. V. Fabriek Van Chemische Production, discloses the use as fungicides of salts of dithiocarbamic acid or alkylene-bis-dithiocarbamic acids with basic dyes.

U. S. 2,883,319, issued April 21, 1959 to Abraham Bavley and Donald P. Cameron, assigned to Chas. Pfizer & Co., Inc., discloses the use as acaricidal agents of compounds such as di(3-(dimethylthionophosphonothio)propyl)-maleate.

U. S. 2,883,320, issued April 21, 1959 to Louis G. Nickell, assigned to Chas. Pfizer & Co., Inc., discloses the use as a fungicide of 1,8-dihydroxy-9-anthrone.

U. S. 2,883,321, issued April 21, 1959 to Van R. Gaertner, assigned to Monsanto Chemical Co., discloses a fungicidal composition consisting of the reaction product of a phenylhydrazine with carbon disulfide.

INTERVIEW with Congressman Metcalf (*from page 32*)

A. No. Most manufacturers I've talked with and have heard about have been in favor of intensive research (such as my recent bill would accomplish) once they understand that I'm not trying to prohibit the use of pesticides. I feel that most manufacturers are genuinely concerned.

Q. *Do you think that industry should undertake to fully investigate its pesticides before releasing them for sale?*

A. It is an industry responsibility. By and large, industry has performed to the best of its capabilities. But frequently the conventional checks are not sufficient, and that's where the government comes in. Industry and government have equal and parallel responsibility.

Q. *Walter M. Allen of Montana's Fish and Game Department noted that a tax-per-gallon-of-pesticide levy on manufacturers had at least been suggested—the money to be used for research. Do you think that such a levy 1) would be acceptable to manufacturers and 2) would provide the necessary funds?*

A. I think that manufacturers would go along with such a tax—BUT it won't ever be instituted. Manufacturers realize that a switch in public opinion would mean lower sales of pesticidal material. In answer to the second part, a tax would not be a good way to raise research dollars because the government itself is a large user of pesticides. Unless the government taxed itself, a tax would not raise enough revenue. Besides, research money should come from general government funds when the general public is to benefit.

Q. *Of over 800 Alabama farmers recently surveyed on the success of the fire ant program, 99 per cent replied that it was fulfilling its purpose with little or no observable damage to wildlife. Is it not, after all, the farmer, forester, or rancher who should be considered first?*

A. No, it's not the producer. It's the public which should get first consideration. The fire ant program has done more harm than good—the detrimental effects far outweigh the benefits. All one has to do is look at the number of animals which were reported killed by the program.

Q. *Do you agree with Dr. Fairfield Osborne of the New York Zoological Society that we should stop spraying against pests until we know all the effects of these pesticides?*

A. We'll never know all the effects. But we should stop spraying some of the highly toxic pesticides. For instance, the chemicals used in the fire ant program are highly toxic to all forms of life.

Q. *Congressman, what is your opinion of the recent controversial article in* Reader's Digest *"Backfire in the War Against Insects"?*

A. I think it was a good article. It summed up very well some of the dangers we face with pesticides.

Q. *Testimony presented at the noted "DDT Trial" last year in New York stated that fish and wildlife populations will re-establish themselves within a year or two following a pesticide application. Would you comment on this testimony?*

A. Yes, I've heard that populations will re-establish themselves by natural means. Where natural means fail, man can step in and restock artificially. For two or three years, though, there's an economic loss, a no-hunting-no-fishing loss. Subsequent restocking may not be in the same balance. Also, we don't know the long term effects of these pesticides.

Q. *You have recently introduced an amendment which would add over $2.5 million for pesticide research—this sum would be added to last year's authorization of $280,000. Does your amendment stand a chance of passage in a cost-conscious Congress?*

A. Yes, it does, because it's been cleared by both the Administration (through the Department of Interior) and by the Budget Bureau. The additional funds are both worthwhile and urgently needed, and I'm confident that the bill will pass this year. ▲

CHELATES in Florida Citrus Production

By C. D. LEONARD*

THE FLORIDA citrus industry is unique in at least two respects—it is the largest in the world, and more than half of the trees are planted on some of the world's most infertile soil. The heavier, more fertile soils were first planted to citrus, but soon growers were plagued with tree "diseases" of unknown cause which were later found to be due to various essential nutrient deficiencies. As the supply of the more fertile soils was exhausted, and the industry expanded to the infertile sands, these deficiency problems multiplied. It was not until the 1930's that four of the most serious "diseases" were identified as deficiencies of magnesium, manganese, zinc, and copper, and in 1951 the Yellow Spot "disease" was identified as molybdenum deficiency.

By 1951, severe iron deficiency had appeared in thousands of acres of Florida citrus on both acid and calcareous soils. In citrus this deficiency causes a yellowing of the interveinal areas of the leaves, while the veins remain green. The chlorosis is particularly evident on the young leaves. In severe cases of the deficiency, production drops sharply, fruit quality is lowered, and many limbs die back.

Since the essentiality of iron for green plants had been shown by Gris of France in 1845, the leaf pattern of iron deficiency was well known. Correction of the deficiency, however, was another matter. It was, in fact, the most difficult of all nutrient deficiencies to correct. Even 100 pounds of iron sulfate per tree applied to the soil was ineffective. Iron sprays resulted only in formation of a few green spots on the chlorotic citrus leaves.

An intensive research program led to the discovery late in 1951 that a small soil application of the iron chelate of ethylenediamine tetra-acetic acid (Fe-EDTA) would correct iron chlorosis in citrus growing on acid soil. Since that time, rapid expansion of chelate research in industry and by many state and federal agencies has resulted in the accumulation of a great deal of information on the theoretical and practical aspects of chelate utilization in agriculture. This discussion will be limited primarily to the more practical phases of chelate research conducted with citrus in Florida.

* *University of Florida, Citrus Experiment Station, Lake Alfred.*

Rates of Application And Longevity of Treatment

In studies conducted to determine the optimum rate of application, five grams of iron (Fe) per tree applied broadcast to acid sandy soil in the form of FeEDTA gave almost complete greening of iron chlorotic orange trees. Ten grams of iron completely greened severely chlorotic trees within two months, and maintained them in a green condition for 10 months. Twenty grams of iron (about 14 ounces of an iron chelate containing five per cent iron) per tree completely greened severely chlorotic trees within two months. They remained green for 17 months, with only a very mild iron chlorosis appearing after 24 months. The untreated trees became even more chlorotic and there was a continuous dying back of the twigs during the course of the experiment.

Following the application of FeEDTA to severely iron-chlorotic trees on acid soil, the old chlorotic leaves green up and there is a vigorous growth of new green leaves. The new growth is often accompanied by profuse blooming which may occur even during the winter dormant season when the chelate is applied in late fall or early winter. The correction of even mild iron deficiency with FeEDTA results in increased length and weight of new shoot growth. The iron content of leaves from chlorotic citrus trees is greatly increased by chelated iron treatments but there is no

▲ **Orange tree** on acid, sandy soil showing severe dieback and chlorosis caused by iron deficiency. Many such trees were destroyed before iron chelates were used as iron sources.

▶ **The same tree,** showing recovery from iron deficiency only 8 weeks after soil application of 20 grams iron as FeEDTA.

▼ **Six years later,** the tree shows excellent growth. It received two more treatments, spaced about 30 months apart, of 20 grams iron as FeEDTA after the original application.

change in the leaf content of nitrogen, phosphorus, potassium, magnesium, manganese, or zinc.

Iron chelate treatment of green citrus trees (those showing no iron chlorosis) will increase the iron content of the leaves, but there is no evidence that it will improve tree condition, increase growth or fruit production, or improve quality of the fruit.

In Florida, chelated iron is usually applied broadcast to citrus as part of a mixed fertilizer. Both phosphate and dolomite are used in many mixed fertilizers. To evaluate the effect of these constituents on availability of iron chelate, solutions of FeEDTA were sprayed on superphosphate, dolomite, and mixed fertilizer containing only 6 per cent phosphoric acid and applied to chlorotic orange trees. There was little or no greening of the trees even at rates of 40 to 50 grams of iron per tree.

Excellent greening was obtained, however, when dry FeEDTA was added to mixed fertilizers and these combinations applied in amounts sufficient to supply 20 grams of chelated iron per tree. This indicates that it is not necessary to apply the dry chelate separately from the other fertilizer.

Yield and Quality of Fruit

Application of 20 grams of iron as FeEDTA in a mixed fertilizer to Valencia orange trees with moderately severe iron chlorosis more than doubled the yield of fruit during the first year, even though the crop was already set on the trees at the time of treatment. The check trees, which received the same amount of fertilizer but no chelated iron, remained chlorotic. During the second year after treatment, the chelate-treated trees yielded more than four times as much fruit as the untreated trees. The amount of increase in yield of fruit which can be expected from treating iron chlorotic trees with FeEDTA will depend on the severity of the chlorosis as well as on tree size.

Florida state laws require the attainment of certain minimum standards of fruit quality before interstate shipment of citrus fruit is permitted. The rapid development of the frozen citrus concentrate industry has focused particular attention on the internal quality of citrus fruit, since processing costs are lower for fruit with a high content of soluble solids (most of which are sugars). In fact, most fruit used for canning or concentrating is now bought on the basis of pounds of solids in the juice rather than by weight of fruit alone.

Oranges from trees on which iron chlorosis had been corrected with FeEDTA contained more juice than fruit from untreated trees. The juice from the treated trees also contained more soluble solids and slightly less citric acid and vitamin C. The ratio of soluble solids to acid (a key factor in legal maturity requirements) was higher in juice from treated trees than that from chlorotic trees. Orange trees showing severe iron chlorosis produced fruit with poor rind color and poor color of juice.

Effect of Chelate Treatment On Root Growth

Soil applications of FeEDTA to iron-deficient citrus trees result in a significant increase in growth of feeder roots. In general, root growth increases in proportion to the severity of the iron chlorosis which was corrected. Six months after an application of FeEDTA to severely chlorotic trees, the feeder root concentration of the treated trees was 8 times as great as that of similar untreated trees. Feeder root concentration was doubled by FeEDTA treatment of moderately chlorotic trees.

Effect of Different Chelates

Field studies were made with orange trees on acid sandy soils to compare different chelates at two rates of application. The iron chelates tested included those of hydroxyethyl ethylenediamine triacetic acid (EDTA-OH), EDTA, cyclohexane 1,2 diaminetetraacetic acid (CDTA), diethylenetriamine pentaacetic acid (DTPA), and ethylenediamine di(o-hydroxyphenyl) acetic acid (EDDHA). Also included were the trisodium salt of EDTA (Na_3EDTA) and the zinc, manganese, and copper chelates of EDTA.

At both 10 and 20 grams of iron per tree (or the equivalent in chelating capacity of those chelates that contained no iron), all the chelates except FeEDDHA completely corrected iron chlorosis and substantially increased the iron content of the leaves. FeEDDHA was unsatisfactory at both the 10 and 20 gram rates. The zinc and manganese chelates of EDTA and Na_3EDTA were as effective as FeEDTA in correcting iron chlorosis; copper EDTA gave a slower response than the others. The correction of iron chlorosis with a zinc, manganese, or copper chelate of EDTA, or with its sodium salt, is due to iron in the soil replacing the other metal from the EDTA and forming the far more stable ferric iron chelate which is then available to the tree.

Chelate Toxicity

FeEDTA is quite toxic to some plants, but 1,000 grams of iron per tree applied as 44 pounds of a chelate containing 5 per cent iron was required on acid sandy soil before any symptoms were produced on the leaves of mature citrus trees. This exceptionally high rate caused dark brown spots to appear on some leaves, but they contained no more iron than leaves from trees receiving much smaller amounts of iron chelate. Similar symptoms of toxicity were produced by FeEDTA-OH applied at the rate of only 200 grams of iron per tree. Young citrus trees, especially during their first year in the grove, are far more susceptible to injury from iron chelates than are mature trees, and may be killed by relatively small applications of chelate.

When finely divided FeEDTA is applied in mixed fertilizer with a mechanical distributor, dust containing chelated iron tends to settle on some of the fruit. If the dust becomes moist, as from dew or a light shower, it causes a dark brown burn on the fruit. This may result in considerable fruit drop. The burn is caused by the iron, not by the EDTA. This burn has been prevented by using dustless forms of FeEDTA, either on vermiculite or in the form of pellets.

Chelates on Calcareous Soils

Iron chlorosis in Florida citrus growing on calcareous soils (lime-induced chlorosis) is not related to

the total amount of iron in the soil. Calcareous soils very high in total iron often produce iron-chlorotic trees. The formation of iron carbonates, oxides, and hydroxides renders much of the soil iron as well as applied iron unavailable to the trees. Iron hydroxide is more stable than most iron chelates and in many calcareous soils the hydroxyl iron concentration is sufficient to remove much of the ion from these chelates. Furthermore, there is considerable adsorption of both iron and EDTA by clays and calcareous soils. Some chelating agents, however, can keep iron soluble and available to plants under these conditions.

Iron chelates that are effective in small amounts on acid sandy soils are required at much higher rates to correct iron chlorosis in citrus growing on calcareous soils. As much as 100 to 300 grams of iron as FeEDTA has been required to correct iron deficiency in citrus on calcareous soils in Florida. This high requirement makes its use on these soils impractical because of the cost of the chelate. On some such soils, FeEDTA-OH completely greened chlorotic trees when applied at rates as low as 25 grams of iron per tree. The results have not been consistent, however, due probably to the great variation in the lime and clay contents of these soils. In a few soils, even 75 to 100 grams of iron per tree as FeEDTA-OH has not corrected the chlorosis. The minimum recommendation of 50 grams of iron per tree in this chelate, however, is effective on many calcareous soils in Florida. FeDTPA has been about equal to FeEDTA-OH, while the iron chelate of dihydroxyethyl ethylenediamine diacetic acid (FeEDDA) has been little better than FeEDTA on Florida's calcareous soils.

FeEDDHA (Chel-138 Fe), which was the poorest source of iron among the synthetic chelates on acid sandy soil, has been the most efficient of all chelates tested on the calcareous soils. It usually produces complete greening of chlorotic trees within 6 weeks, and has been effective in amounts as low as 10 grams of iron per tree on all calcareous soils tested. It also raises the iron content of the leaves to a higher level than any other chelate. It has been effective on soils where 100 grams of iron per tree as FeEDTA-OH or FeDTPA has failed to correct iron chlorosis.

The chief disadvantages of FeEDDHA are its high cost and the fact that its effective life is comparatively short. Iron chlorosis usually returns within a year after treatment with FeEDDHA at the rate of 10 to 20 grams of iron per tree, although at higher rates the trees remain green somewhat longer.

FeEDTA-OH and FeDTPA when applied at 50 to 75 grams of iron per tree may require 6 to 8 months to correct iron chlorosis on calcareous soils, but the trees usually remain green for three or four years. The use of FeEDDHA is, therefore, most practical on those soils where other chelates are not effective or must be applied in excessive amounts. Ferric ethylene bis (alpha-imino-2-hydroxy-5 methyl phenyl acetic acid) (FeRA-157), a chelate closely related to FeEDDHA, has been ineffective as a source of iron for citrus on Florida's calcareous soils at rates up to 30 grams of iron per tree. Application of the sodium salt of EDTA-OH without iron was about as effective as FeEDTA-OH. Application of EDDHA without iron, however, was considerably less effective than use of its iron chelate.

Zinc Chelates

Soil application of zinc sulfate, zinc chelates, or other zinc sources has not been effective in correcting zinc deficiency of Florida citrus. Zinc is taken up in limited amounts from soil application of zinc sulfate but in field trials 10 pounds of zinc sulfate per tree did not correct zinc deficiency. There was no measurable uptake of zinc from ZnEDTA or ZnEDTA-OH when these materials were applied alone to the soil. Consequently, zinc is applied to most Florida citrus groves as a nutritional spray. Although foliage sprays correct zinc deficiency in citrus, zinc does not translocate from the sprayed leaves to new growth. Some zinc enters through the young twigs, however, and moves into the new growth.

In laboratory studies, the zinc chelate of EDTA was found to be much less stable in soil than the iron chelate. In the soil, where there is an excess of iron, the zinc in ZnEDTA exchanges for soil iron resulting in formation of FeEDTA. This replacement reaction has been demonstrated in the field where iron chlorosis in orange trees growing on acid sandy soil was corrected by application of zinc EDTA. Precipitation of the soil iron at a high *p*H is the most effective method found to date to make zinc chelates useful sources of zinc for citrus in Florida. A mixture of soda ash (Na_2CO_3) and zinc chelate is applied over limited areas in several piles (of about one square foot each) or in narrow bands beneath the trees. Enough soda ash is used to temporarily raise the *p*H of the treated areas to about 10.0.

Since soda ash is water-soluble, the soil *p*H is increased to a depth of several feet. This precipitates most of the soluble soil iron so that it cannot react with the zinc chelate. Since the chelated zinc is soluble in water even at a *p*H above 11.0, it remains in a form available to the trees. Additional research is needed to develop a zinc chelate which will be effective when applied broadcast.

Chelates as Foliage Sprays

Iron sulfate and other inorganic iron compounds applied as foliage sprays will not correct iron deficiency in Florida citrus. Iron chelate sprays have been equally unsatisfactory. Iron chelates of several lignosulfonates have been ineffective in correcting iron chlorosis in citrus when applied as a foliage spray or on the soil. On the other hand, zinc foliage sprays are much more effective than zinc applied alone to the soil. It is impractical to apply zinc chelates as foliage sprays because they are more expensive and less effective than inorganic zinc sources.

Current Research

Research in progress on the use of chelates in Florida citrus is directed toward finding more effective and less expensive sources of iron for calcareous soils, and the development of practical methods of using chelates of zinc, manganese, and magnesium as sources of these elements. ▲

Producing HIGH N GRADES in the continuous ammoniator

FOR SOME TIME there has been considerable interest in the production of granular fertilizers that contain more nitrogen than P_2O_5 or potash. The usual ratio for these "inverse ratio" grades is 2:1:1, the most popular grade being 16-8-8. In recent months the reports of particularly good agronomic results in the use of 16-8-8 and 14-7-7 for pasture land fertilization have accelerated further the interest in suitable formulations for fertilizers of this type.

In the continuous ammoniator pilot plant we have tested several different formulations for 20-10-10 and 16-8-8 grades using various materials to supply the major portion of the nitrogen content. Among these materials were ammonium sulfate, solid ammonium nitrate, 83 per cent ammonium nitrate solution, and TVA-produced 30-10-0. Data from some of these tests are shown in the table.

TESTS UTILIZING 30-10-0

30-10-0 ammonium phosphate nitrate has been produced in demonstration-scale equipment by TVA during the past year for use in educational programs. It is made by granulating wet ammonium nitrate crystals with phosphoric acid and anhydrous ammonia in a rotary drum. The product is dried to about 0.3 per cent moisture, screened at minus 6 plus 16 mesh, and coated with a conditioning agent. It is shipped either in bags or in bulk. It is available in limited tonnages to fertilizer manufacturers for trial use in mixtures at $58 per ton, bulk, f.o.b. Sheffield, Alabama.

While 30-10-0 is produced primarily for bulk blending and direct application, it is well suited as a raw material for the production of inverse ratio grades. It does not add heat and moisture to the formulation; it is a higher analysis source of nitrogen than ammonium sulfate, and it has better bulk-handling properties than solid ammonium nitrate. Also, it provides a high analysis source for part of the P_2O_5 requirements.

Pilot-plant tests have been made using 30-10-0 to supply about 18 units of nitrogen in the production of 20-10-10. The balance of the nitrogen was supplied as anhydrous ammonia or nitrogen solution.

Typical data obtained when ammonia was the supplementary nitrogen source are shown in test 1 in the table. The other ingredients were ordinary and triple superphosphate, nongranular potassium chloride, and sulfuric acid. A small amount of water needed to promote granulation was fed with the ammonia. The recycle rate was 600 pounds per ton, and the ammoniator product temperature was 190° F. The loss of ammonia was moderate, and granulation efficiency was high.

The formulation using nitrogen solution is shown in data from test 2. This formulation probably would be more economical in most locations because it requires no sulfuric acid and about 1.5 units of ordinary superphosphate can be used. This formulation was not satisfactory in the pilot plant without the use of steam to supplement the low heat of reaction. When a small amount of steam was added under the bed in the ammoniator, the results were comparable to those obtained with the formulation that contained anhydrous ammonia and sulfuric acid. In a test in a large-scale ammoniator, no steam was required, however, due presumably to the proportionately lower heat loss from the larger unit.

30-10-0 is normally produced with a large portion of the product in 6- to 8-mesh-size fraction. For use in the continuous ammoniator, better results would be obtained by using minus 8-mesh material to minimize the amount of oversize produced when other ingredients are coated on larger particles of 30-10-0.

USE OF AMMONIUM SULFATE

Pilot-plant tests were made of the production of 16-8-8 using various proprtions of ammonium sulfate and ammoniating solution as the source of nitrogen. Other ingredients were ordinary and triple superphosphate, potassium chloride, and sulfuric acid. The amount of ammonium sulfate was varied from 4 to 10 units to determine the minimum that could be used without requiring excessive recycle rates (1000 lb./ton or less). About 8.5 units of ammonium sulfate was the minimum requirement for operation without excessive agglomeration. Data obtained when using this amount of solution are shown as test 3 in Table II. Use of one of the low-moisture (6 to 7% H_2O) ammoniating solutions probably would reduce the amount of ammonium sulfate required and thereby reduce the cost of the formulation.

USE OF AMMONIUM NITRATE

A formulation for 20-10-10 which utilized 14 units of nitrogen as granular ammonium nitrate was tested (test 4 in table) in the pilot plant. It is believed that prilled ammonium nitrate would give similar results. Other raw materials were ammoniating solution X-6, triple superphosphate, nongranular potassium chloride, and sulfuric acid. A small amount of water (15 lb./ton of product) was used to promote bonding of the fine particles to the granular material. The granules of ammonium nitrate used in this test were 67 per cent plus 10 mesh in size, and

Presented at the TVA Pilot-Plant Demonstration of Fertilizer Technology, June 9–11, at Muscle Shoals, Ala.

the bonding of other ingredients to them resulted in the production of a considerable amount of plus 6-mesh material. It is believed that a higher proportion of onsize product could be produced by using ammonium nitrate granules of smaller size.

Data for a test in which 83 per cent ammonium nitrate solution was used to supply 18 units of nitrogen are shown as test 5 in the table. The remaining 2 units of nitrogen were supplied as anhydrous liquid ammonia. There was room in the formulation for about 1.5 units or ordinary superphosphate; however, for convenience, only triple superphosphate was used. No acid was used. The ammonia and ammonium nitrate solution were fed through a common distributor that extended over the full length of the ammoniator. The large amount of liquid phase in the formulation made it necessary to use a high rate of recycle (4320 lb./ton of product) to obtain satisfactory granulation. A fairly high rate of cooling air also was used in the drum. Without air for cooling, a still higher rate of recycle probably would be necessary. Also, the use of ammonium nitrate solution would require special facilities that are not available in most plants since it must be kept hot to avoid crystalization. For these reasons, formulation with ammonium nitrate solution does not appear to be attractive.

STORAGE TESTS

Tests were made to evaluate the bag- and bulk-storage properties of the 16-8-8 and 20-10-10 grades produced in the pilot plant. The products were stored in six-ply paper bags having two asphalt-laminated plies. Test bags were placed in the bottom four positions in a stack twelve bags high. The moisture content of the material as stored ranged from 0.3 to 0.8 per cent.

When the 20-10-10 products had been conditioned with 2.5 per cent kaolin or Celite, little or no bag set occurred during 1 to 3 months of storage. There were no lumps present after the standard drop test. Unconditioned products had only a light bag set after 1 month of storage. No advantage was noted in curing the products prior to bagging.

When the 16-8-8 product had been cured 1 week and conditioned, a medium bag set occurred during 1 month of storage, but there were no lumps after the drop test. Without prior curing, the bag set was hard, but there were no lumps after the drops. The condition of the material was the same after 3 months of storage. We believe that the combination of ammonium nitrate and ammonium sulfate may have caused the increased bag set in the 16-8-8 grade. We have found that in dry mixes the inclusion of both of these materials results in increased caking.

Several of the 20-10-10 products with and without the addition of a coating agent were stored in open piles for 1 to 4 weeks. During humid periods a moist layer ½ to 1 inch thick formed on the surface of the pile. During less humid periods this layer would become dry and would cake lightly. The material beneath this layer was in good condition. These materials should store satisfactorily in bulk if precautions are taken to reduce the exposed surface area although early bagging would be preferable. ▲

Data for Pilot-Plant Tests in Production of Granular 2:1:1 Ratio Fertilizers

Grade	20-10-10		16-8-8	20-10-10	
Major source of nitrogen	30-10-0	30-10-0	Ammonium sulfate	Ammonium nitrate Solid	Ammonium nitrate Solution
Test No.	1	2	3	4	5
Production rate, tons/hr.	2	2	2	2	0.5
Formulation, lb./ton of product					
Anhydrous ammonia	60	0	0	0	43
Ammoniating solution[a]	0	98(X)	383(X)	288(X-6)	0
Ammonium nitrate	0	0	0	848[c]	1337[d]
Ammonium sulfate	0	0	869	0	0
30-10-0	1233	1194	0	0	0
Ordinary superphosphate	133	401	54	0	0
Triple superphosphate[b]	128	0	322	440	495
Potassium chloride	338	329	272	338	358
Sulfuric acid (93% H_2SO_4)	122	0	166	106	0
Water	30	0	0	15	0
Steam	0	54	0	0	0
Recycle	608	390	404	466	4320
Air, cu. ft/ton of product	0	0	6000	0	6360
Lb. NH_3 fed/unit of available P_2O_5	4.8	5.7	3.5	3.5	3.6
Moisture, %					
Input to ammoniator	2.0	4.1	3.0	2.0	4.0
Ammoniator product	1.7	2.4	1.5	2.2	3.2
Screened product	0.4	1.0	0.4	0.6	0.3
Temperature, °F.					
Ammoniator	189	129	201	191	148
Dryer	202	191	200	215	219
Loss, %					
Free NH_3, by gas analysis	2	2	6	5	10
P_2O_5 availability in superphosphate	0.5	0	0.3	0.7	1.6
Screen analysis of dryer product, %					
Oversize (+6 mesh)	34.7	30.7	23.5	62.6	34.5
Onsize (−6 +16 mesh)	58.0	51.3	60.2	35.3	62.4
Undersize (−16 mesh)	7.3	18.0	16.3	2.1	3.1
Onsize material after crushing oversize, %	79	70	78	73	83

a

Solution	Composition, % NH_3	NH_4NO_3	H_2O
X	22.2	65.0	12.8
X-6	25.0	69.0	6.0

b Material (48 to 49% A.P.A.) made from electric furnace phosphoric acid.
c Granular.
d 83 per cent ammonium nitrate.

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EDITORIAL

FC

Who will control the farm chemicals market in 1975?

We're still asking questions! This issue contains two exclusive interviews. But the one we are concerned about in this editorial is the Bob McCormick interview. He's the Dixon Chemical sales manager for the Philadelphia office. He was more than cooperative in answering our questions about the sale of the I. P. Thomas tradenames and inventories to Baugh & Sons, Baltimore, last month. The interview is on page 21.

Do you feel that you *thoroughly* understand your market—that you possess all the necessary market data about your farmers and the geographical area you serve?

All trends point to the farmer becoming bigger, more sophisticated, better educated and more business-minded.

A leading marketing and management counsel, Alderson & Associates, Philadelphia, publishes a monthly "Cost and Profit Outlook," from which we picked up this appropriate quote:

"To the extent that every company's market position is unique, there is a best strategy for it which should be followed regardless of competitive tactics."

Thus, no matter how much we love to engage in "grand stand managing" we must assume that Dixon Chemical Industries followed its "own best strategy" in selling the I. P. Thomas tradenames and inventories to Baugh & Sons, Baltimore!

We don't know whether Dixon "developed its fertilizer marketing program effort fully in advance or whether it was primarily concerned with fathoming the moves of competition and being prepared to counter them." As Alderson & Associates points out:

"The best point of compromise between a fully scheduled program and holding some resources in reserve varies, of course, with the competitive field and with the size of the company and its flexibility in action.

"In most established organizations it is better for management to concentrate on its own job than on what competition is doing."

What do your market projections tell you about the farmer of the future? Do you think he'll be a "co-op" man, as Bob McCormick has forecasted?

FARM CHEMICALS feels that there are several important developments which can tell you much about your future business.

1) *The big operator.* A new kind of farmer is evolving from the agricultural revolution we've been experiencing. He's a "thinking man," if you'll pardon the commercial twist. He knows where he's going and he's not tied to any organization. He's a *businessman.* Sure, he's going to save as much on fertilizer as he possibly can. But he's more apt to be influenced by logic and recognize the advantages of one company's product over the other. We also think he'll be more apt to have brand loyalty.

2) *Farm management consultant.* Here's a man who will play a bigger role in farming with each passing year. As this month's feature, "When Will Farm Chemicals Come Into Their Own?" points out: farm managers utilize the most efficient farm practices. It's just good business for them to use the best products because their future is linked to their ability to *guarantee* farmer customers increased yields.

Secretary of Agriculture Benson was most optimistic last November when he said:

"By 1975 the market for agricultural chemicals . . . is expected to reach 3¼ billion dollars—one billion for pesticides—2¼ billion for fertilizers."

Undoubtedly, farm operators of the future will demand more service than ever. You must start now in making necessary adjustments for this changing market. There will be additional changes in your territory as super highways and commercial developments of all types cut a swath through valuable farm land. There will also be changes in the types of farm chemicals used and new methods of application.

More and more farmers will be telling *you* what they expect in the way of facilities and services. And the farm businessman of the future will be big enough to get what he wants.

But even more important is *brand loyalty.* That's something that the best facilities will never produce. It withstands all types of competitive tactics and emerges stronger every season.

What "secret mix" is involved in producing brand loyalty? Certainly those companies who are enjoying it "aren't talking." And what works for one company may not work for another. The best marketing program is the one that sets a consistent pattern. You can't be conservative for 50 years and then suddenly adopt a sensational policy, without raising some eyebrows.

No more questions!

GORDON L. BERG

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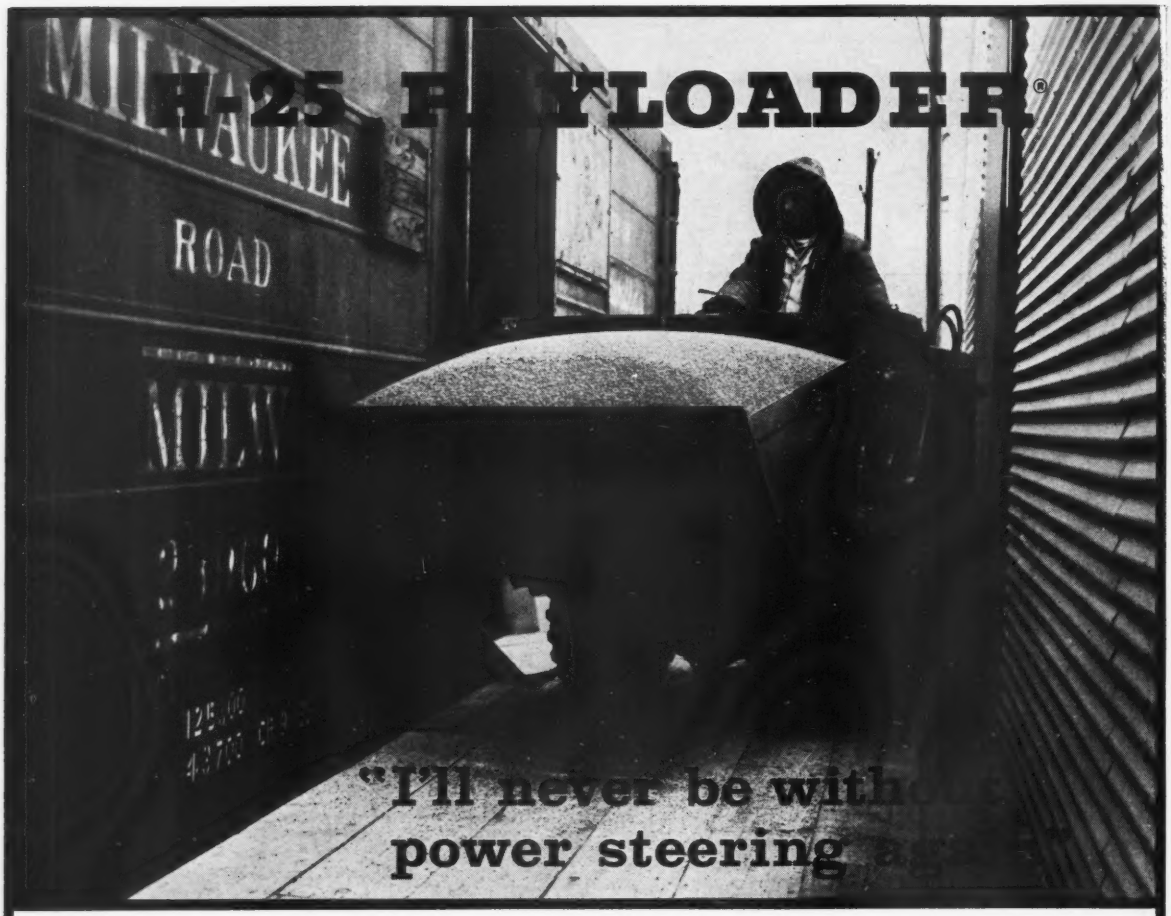

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